Student Registration and Evaluation System for Elementary School

by

Ms. Varuesa Wannakhun

A Final Report of the Six-Credit Course
CS 6998 - CS 6999 System Development Project

Student Registration and Evaluation System for Elementary School

by
Ms. Varuesa Wannakhun

A Final Report of the Six-Credit Course
CS 6998 – CS 6999 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
Assumption University

November 2002

Project Title	Student Registration and Evaluation System for Elementary School
Name	Ms. Varuesa Wannakhun
Project Advisor	Dr. Boonyarit Pokrud
Academic Year	November 10, 2002

The Graduate School of Assumption University has approved this final report of the six-credit course, CS 6998 – CS 6999 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

Approval Committee:
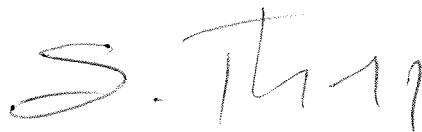

_____   _____
(Dr. Boonyarit Pokrud)   (Prof.Dr. Srisakdi Charmonman)
Advisor   Chairman

_____   _____
(Air Marshal Dr. Chulit Meesajjee)   (Asst.Prof.Dr. Vichit Avatchanakorn)
Dean and Co-advisor   Member

_____
(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

November 10, 2002

ABSTRACT

The Choosilp Wittaya School is the private elementary school that provides the compulsory education program for young students. The registration and evaluation system is the important part of information system of the school. In order to provide the Registration and Evaluation for the students, many processes are required, and they have to deal with other departments. This project is to develop the effective information system to facilitate the process of Registration and Evaluation.

The current Registration and Evaluation System is based on a manual system. Most data is stored on paper, while some are kept in the Microsoft Excel, Microsoft Word on computers. Many administrative staff are required to maintain the system. They have to deal with the general problems of a manual system, which are error-proneness and high maintenance costs.

A new proposed Registration and Evaluation System is developed to replace the manual system. All data are kept in the database server, Microsoft SQL Server 7.0, and are accessed through the client machines, using Microsoft Windows 98 SE. Application programs running on client machines are developed using Microsoft Visual Basic 6.0. The new system will help to reduce the number of administrative staff, solve the problems of the manual system and decrease the high maintenance cost.

ACKNOWLEDGEMENTS

Several people have made contributions to this project. The writer would like to acknowledge their efforts and thank them for their contributions.

The writer would like to thank Dr. Boonyarit Pokrud, my project advisor, for his valuable suggestions and advice given into the preparation of this project.

The writer extends my sincere thanks to Mr. Piyabut Kittipongse, Assistant manager and Mr. Dumrih Kittipongse, Senior Executive Manager, Choosilp Wittaya School for their timely assistance and information provided to me while carrying out the data collection required for the project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ix

I. INTRODUCTION

1.1 Background of the Project

Information has become increasingly important to management, including that of education. It is needed for operations, controlling and planning at all levels: Institutional, regional and national. In order to make such information really accessible, information systems should be properly designed and computerized.

Over the past few years, a considerable amount of effort has been expended to devise better ways of resolving administrative and planning problems faced by the institution of education. As a result of experience, a certain amount of basic knowledge and management expertise has been accumulated in a number of areas.

Computerized information has been successfully used in business and industry in situations similar to those arising in educational institutions. Consequently, it can be postulated that the performance of educational institutions can be upgraded by the use of properly designed and implemented computerized information systems. The effectiveness of any educational institution depends greatly on the collection and transfer of information. A variety of "inputs and outputs" are associated with each part of the educational process.

The effective use of Student Registration and Evaluation System for Elementary School can benefit school by providing the facilities to strengthen the management of learning, minimize non-teaching tasks and maximize the benefits of information and data when stored on computer. Management and learning decisions can be much more sound, credible and resistant to challenge if they are based on reliable and relevant information.

1

1.2 Objective of the Project

The objectives of Student Registration and Evaluation System for Elementary School are as follows:

(1) To study the existing system and identify problem and users requirements.

(2) To design and develop the new information system for elementary school according to the requirement acquired from the users.

(3) To improve the arrangement of the information and use that information in an effective way for management level in order to make a good decision making.

(4) To increase efficiency and effectiveness of system.

(5) To improve system's performance by using computer based information system.

(6) To computerize the processing and maintenance of student data.

(7) Develop a computerized student database that can be updated, modified, detected and corrected when necessary.

(8) To minimize the paper work and reports.

(9) To reduce human errors.

1.3 Scope of the Project

The subject of Student Registration and Evaluation System for Elementary School is confined into 2 subsystems as follows.

(1) Registration Subsystem

(2) Evaluation Subsystem

The project scope covers the major part of the processes or function in this system which includes the following:

(1) Study the problems of the existing system, user requirements and design the most appropriate information system.

(2) To analyze and design database that support information system.

(3) To design the user interface that is easy to use even to those who are not familiar with computers.

(4) To design the reports that provide the highest benefits to the school in all aspect such as management and decision making etc.

1.4 Deliverables

The deliverable for Student Registration and Evaluation System for Elementary School are as follows:

(1) The new Information System analysis and design document.

    (a) Data Modeling (Entity Relationship Diagram)

    (b) Process Modeling (Data flow Diagram)

    (c) System Specification (Hardware and software specification)

    (d) Cost Benefit Analysis (Break-even Point, Payback Period)

    (e) Structure Design (Structure Chart)

    (f) Process Specification (Detail of each process of proposed system

(2) The new Information System input output form design.

    (a) Input Design (Input screen of proposed system)

    (b) Output Design (Report from proposed system)

1.5 Project Plan

After the approval of project from the management, the system analyst has prepared the project plan for Student Registration and Evaluation System as follows.

(1) System Analysis Phase

It is a survey and planning stage of the project, which studies the existing business processes to define the business requirements of the proposed system. Then, requirements are prioritized and analyzed for the solutions. Results are Entity Relationship, Data Flow and Network Diagram.

(2) System Design Phase

It evaluates alternative solutions for the proposed system. It describes the specification with feasibility analysis of each solution for selection. It mainly focuses on technical specification and implementation of the proposed system rather than the logical modeling in system analysis phase. The main activities are database, interface, network and program design.

(3) System Implementation Phase

The proposed system is constructed and delivered into daily operation in this stage. The system testing and training are the activities carried out in this phase. Testing is done after completing construction of the proposed system to ensure that the system can operate in accordance with the requirements. While system-training aims to provide users and system administrators with adequate on how to use and configure the proposed system.

The Student Registration and Evaluation System takes about four months to implement. Each system development phase take about one-third of the total time frame. The project plan of the proposed system is represented in Figure 1.1.

4

No.	Task Name	June				July				August				September			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	I. System Analysis																
1	Define the Objectives and Scope																
2	Study the Existing System																
3	Identify the Existing Problems																
4	Develop System Diagram																
5	Cost and Benefit Analysis																
	II. System Design																
6	Structure Design																
7	Database Design																
8	Network Design																
9	Web Interface Design																
10	Report Design																
	III. System Implementation																
11	H/W and S/W Installation																
12	Training																
13	Site and Data Preparation																
14	Testing																
15	Conversion																

Figure 1.1.   Project Plan of Student Registration and Evaluation System.

5

II.   THE EXISTING SYSTEM

2.1   Background of the Organization

The Choosilp Wittaya School is the private elementary school, which provides the compulsory education program for young students. It has been established since 1947 by a group of missionaries. At the first time, there were 22 students in school and after that the student was increasing every year. The current number of students, instructors and staff is about 1,000 persons. This school is under the administration of Ministry of Education. Choosilp Wittaya School is located at Mueang District, Nakhon Si Thammarat province.

In order to perform the main tasks, Choosilp Wittaya School has the objective to:

(1)   Educate students towards acquisition of attitude, knowledge, skills, communicative ability and ecological consciousness, directed towards the shaping of development minded manpower, with dedication and a sense of responsibility for the future of the nation.

(2)   Prepare students for higher education and advance their knowledge.

(3)   Preserve and develop science, culture and social life.

The school's vision is to provide a multifaceted educational program for students in Choosilp Wittaya School. The students and staff will enhance self awareness and a desire to learn through interdisciplinary and cooperative learning. A primary focus in the basic curriculum will be to improve critical thinking and communication skills. All curriculum developed will be supported with the latest technological programs and equipment. The educational process will be nurtured in the home with parents actively participating in and supporting the school's activities and programs. A cooperative relationship will thus be developed with parents, teachers, administrators, students and community all assisting in the learning process.

The educational program has as its goal to help students acquire basic skills, knowledge, and positive attitudes toward learning. The school emphasizes the growth of the individual child and the relation of the child's progress to individual needs and abilities. Traditional subjects such as reading, writing and mathematics provide tools for learning; and the teacher helps children to recognize problems, work out solutions, and evaluate results.

The school consists of five departments with different responsibility as follows.

(1)   General Office

The main function of the General Office is to deal with other departments, teachers and students. The responsibility of this department is organizing and keeping paper works about student information, grade information, teacher information and summary reports in each department including student request.

(2)   Registration Department

The main function of the Registration Department is to deal with students including their parents and other departments. The responsibility of this department is maintaining the student information after the parents or students fill in the student application. For graduate student, this department maintains the graduate information after the students graduate from the school for future reference. After admit new students in each semester, this department send new student data to teachers, financial department and dean.

(3)   Evaluation Department

The function of the Evaluation Department is to set up course and schedule of students in each classroom including check exam score and

7

attendant data of students in each semester. After that, calculating grade point average, maintaining the grade information and issue transcript for student.

(4)   Financial Department

The responsibility of the Finance Department is to provide income from new student in each semester including staff salary and general payment of school. This department will perform accurate reporting of all finances of school, and to take care of district obligations in an efficient and timely manner with minimal interference to campus activities.

(5)   Student Activities Department

The responsibility of Student Activities Department is to provide proper activities for student in order to develop attitude, knowledge, and unity of students including survival in social environment.

The main principle of the current organization structure of the Choosilp Wittaya School is shown in Figure 2.1.
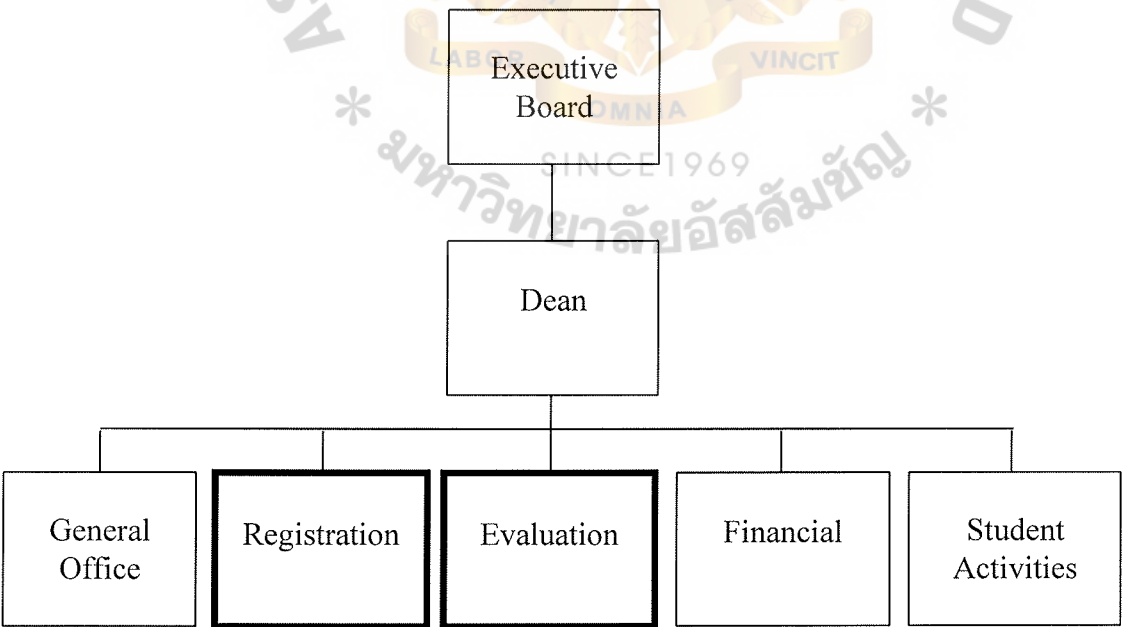
Figure 2.1. Organization Chart of Choosilp Wittaya School.

2.2 Current Problems and Areas for Improvements

The problems of the existing system are:

(1)   Duplication of records and files.

There is a natural tendency for duplication of records among, as well as within departments. The duplication of data is typified by the large number of copies which are required to record various events or activities. Duplication leads to many problems concerning integrity of data, inconsistency, inaccuracy and inflexibility. In a properly designed system, duplication may occasionally be required for some records, but it would normally be minimal and under control by the users.

(2)   Lack of standardization of procedures.

Generally, organizations have specific procedures for handling and filing information. However, as an organization develops new files and makes changes to old ones, the old procedure may not be correspondingly updated to optimize the processing of the current information. This situation leads to problems such as loss of materials through redundant operations and unnecessary copies. The longer these inefficiencies are allowed to continue, the more confusing they become, and the harder it is to change them. A completely new system is usually the best approach when it comes to replacement of a system.

(3)   Untimely information

In today's fast moving environment, data must be available at the right time to users. When data is scattered, with much duplication, the responses to request for information are too slow and often inconsistent. Data required by a user cannot be furnished in a timely manner. A new system is desired to supply users with prompt information.

(4)   Evaluation of students is too slow because of delay in paper work.

        The reason of problem in working is from a lot of document and copies within the working system, and they have a lot of papers or reports to record and perform the tasks. From this problem, the services are too slow that students and other departments have to wait for a long time to get the reports they want. For example, to get the grade report, students have to wait for at least a week in order to allow the officers to check their records and summarize all the information manually.

(5)   Data inaccuracy due to human errors.

        The major problem is duplication records and files, users or officers confuse to record and operate the information. Therefore, this problem is occurred.

(6)   A lot of papers are used unnecessarily.

        For example, if the executive board wants some information, the reports have to be printed out. After that, the reports are discarded, and have to be kept somewhere. So, the office has to provide the space for the documents.

(7)   There are not enough personnel in the office compared to the work that they have to do. The repeated procedures decrease the productivity of the officers. They have to handle redundant procedures, such as seeking for a file, summarizing the information, and typing the reports.

(8)   The information is not up-to-date because the officers need a long time to process requests of any information updates. For example, if the students ask for their information updates, they have to submit the requests and wait until their requests are processed by queue.

The overview of the existing Student Registration and Evaluation System for Elementary School is illustrated by the context diagram in which is constructed to establish the initial project scope. It shows the system as a whole in correlation with its environment that are the external entities involved. It is shown in Figure 2.2.
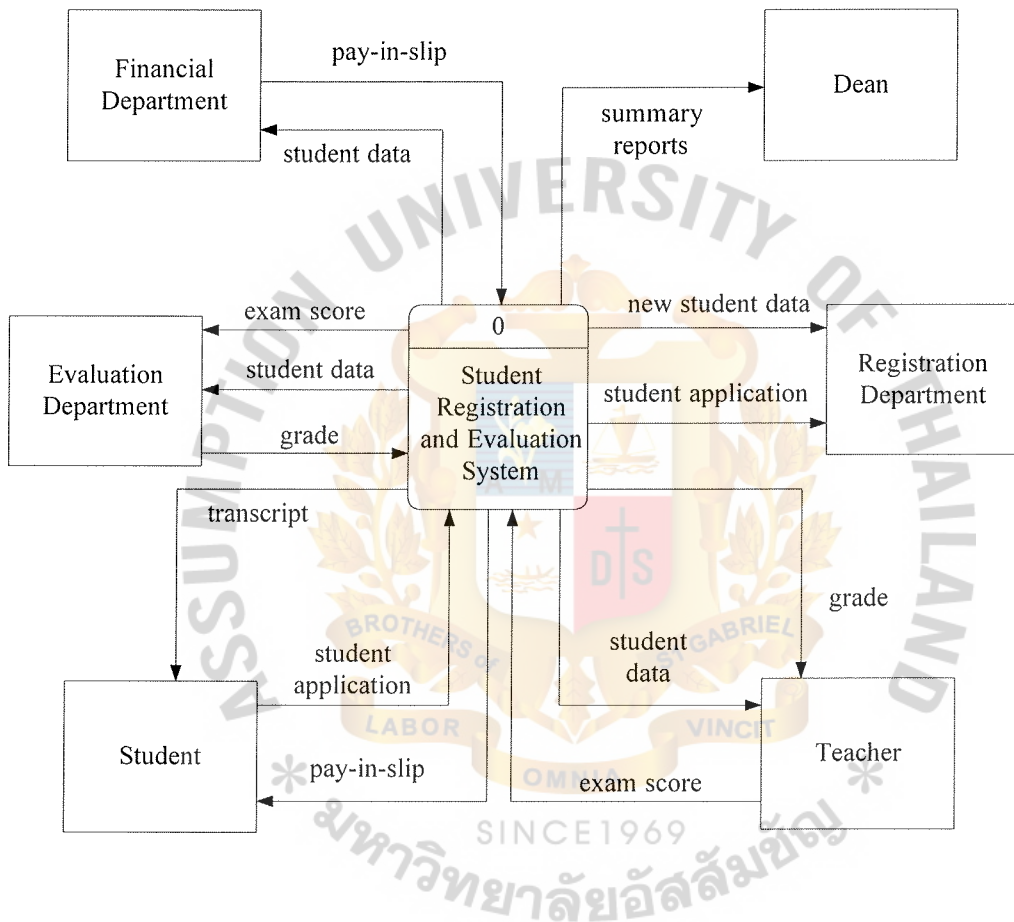
Figure 2.2. The Context Diagram of the Existing System.

11

2.3   The Existing Computer System

In the current existing system, all departments within the school have to handle information manually. The school has a few stand-alone PCs in order to store information. The existing computer hardware and software specifications of school are Intel Pentium II processors 333 MHz with 32 MB SDRAM and 4.3 GB Hard Drive, which run on Windows 98 with installed Office 97 as application program. All PCs are not connected together. The officers record the information such as student information, score and grade into paper before key to computer. Many papers are kept into file shelter like backup file.

In registration and evaluation departments, the officers have to spend almost half an hour to find an individual student record. They have to ask for a lot of student information from the student and compare it with huge record folders stored in enormous shelves and PCs. The student who is applying for grade reports or transcripts also wastes several days getting those reports because the officers have to reprint the records.

Referring to the current registration and evaluation process (the manual system with partial computerization), the existing personal computers (PC) use MS Word and MS Excel, which is a stand-alone program, to process and store the information, therefore it does not take advantage of the registration and evaluation system.

III. THE PROPOSED SYSTEM

3.1 System Specification

According to the previous chapter, Choosilp Wittaya School requires an effective Student Registration and Evaluation System. After searching for an appreciation of realities of the existing system, the executives of the school have requested that a better system be developed. This effective system can solve the problems occurred from the existing manual system with an ineffective partial computerized system.

In order to achieve the target, the new proposed Student Registration and Evaluation System should have the components as follows:

(1) Student database should be redesigned, developed and converted to a high performance database server, available for all responsible staff and departments. Student database should replace the existing manual system to facilitate the current process, to manage the data and provide for inquiries and verification of student information with a new graphical user interface and a more powerful database.

(2) Any Information in database converted from unstructured spreadsheet application file to effective database format designed and developed on database server.

(3) Score Database developed to help a user evaluates and generates student's grade report easily and quickly including solve the problems occurring from the current system.

(4) The new security system replacing the existing manual system must protect the system and not allow unauthorized people to modify, important information such as exam scores and grades.

Requirement Analysis

The requirements define activities or improvements that the proposed system must provide. After all problems are identified and evaluated, the requirements are compared with the performance of the existing system in order to set viable system requirements. The user requirement for the new system can be summarized as follows:

(1) The user needs a secure system that unauthorized people cannot access because the registration information and the scores for subjects are very important. They are official information that must be accurate and must not be modified by unauthorized people.

(2) The accuracy of the information is very important. The information retrieved from the database must be correct, and the results of any calculations such as grade, must also be accurate. The reason is that these documents are official. They will be provided to a third party such as student's parent and high school. The wrong information affects the school's reputation.

(3) The system must have fast response time in order to process requests from students, teachers and others.

(4) Any information should be easy to search because the registration and evaluation departments keep many documents and information of students, teachers and others such as applicant information and exam scores. The system should arrange the information effectively.

(5) The users would like the system to be user-friendly. The system should not require too many parameters, and it should be easy to operate.

(6) The users want several reports such as each student's information, summary registration report in each semester. The system should generate reports directly with users required.

3.2 System Analysis

To gain a better understanding of the new system requirement, a logical model is drawn to depict the system independent of any technical implementation. The detail of each technique can be explained as follows:

Data Modeling

It is a technique for defining business requirements for a database, organizing and documenting a system's data. Data modeling is sometimes called database modeling because a data model is eventually implemented as a database. The actual model is frequently called an Entity Relationship Diagram (ERD) because it depicts data in terms of the entities and relationships described by the data. ERD is the most popular and simplest logical data modeling techniques.

In the requirement analysis results in a logical data model that is developed in three stages. The first stage is "Context Data Model" The intent is to refine our standing scope, not to get into detail about entities and business rules. It establishes the project scope and contains only entities and nonspecific relationships but no attributes. In this proposed system, there are four entities: Financial Department, Student, Teacher and Dean. Each entity has the relationship.

The next stage is "Key-based Data Model". This model will eliminate nonspecific relationships, add associative entities, and include primary and alternative keys. The primary and foreign keys are added to each entity to exhibit the unique characteristic of each entity.

The last stage is "Fully Attributed Data Model". It shows all attributes of each entity that are captured and stored in the database.

The complete entity relationship diagram of the proposed system is shown in Appendix A.

15

Process Modeling

It is a technique for organizing and documenting the structure and flow of data through a system's process and/or the logic, policies and procedures to be implemented by a system's process. The actual model is frequently called "Data Flow Diagram" which is a tool that depicts the flow of data through a system and the work or processing performed by that system. The Context Data Flow Diagram is developed to show how the system interfaces with other systems, business and external organization. Figure 3.1 illustrates the Context Data Flow Diagram of the proposed system. There are four external entities, which are Students, Teachers, Financial Department, and the Dean who can interact with the developed system. The lower levels of Data Flow Diagram are shown in Appendix B.
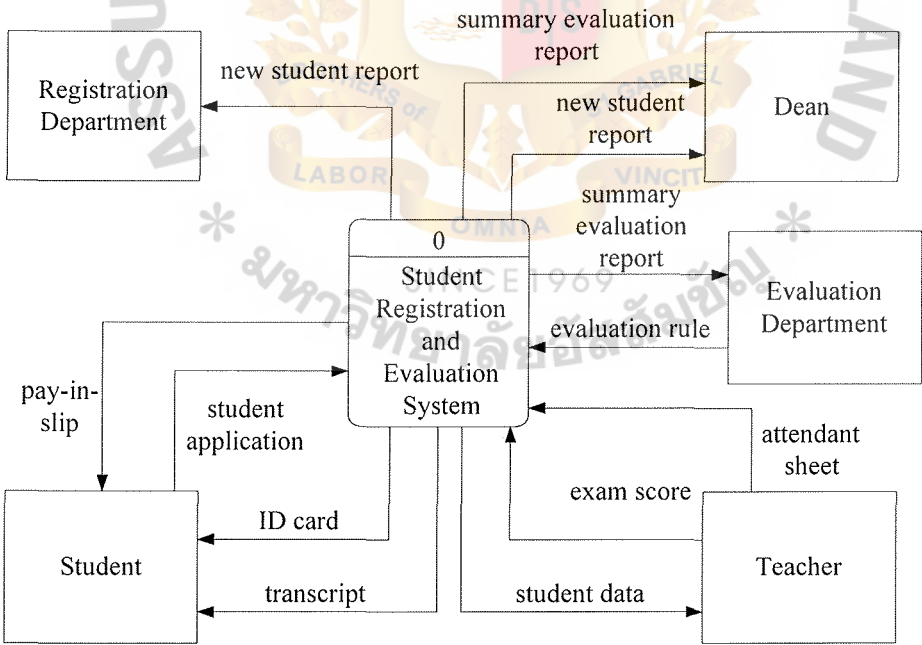
Figure 3.1. Context Data Flow Diagram of the Proposed System.

16

The Data Flow Diagram is normally a complex system, which is usually too difficult to fully understand when viewed as a whole. Therefore, in system analysis should be separate a system into its component subsystems, which are decomposed into smaller subsystems, until we have identified manageable subsets of the overall system. The technique of breaking down a system into its component subsystems, processes and subprocesses is called Functional Decomposition Diagram. It shows the top-down functional decomposition and structure of a system. The Functional Decomposition Diagram of proposed system is shown in Figure 3.2, which composes two main subsystems. Each subsystem has two processes.
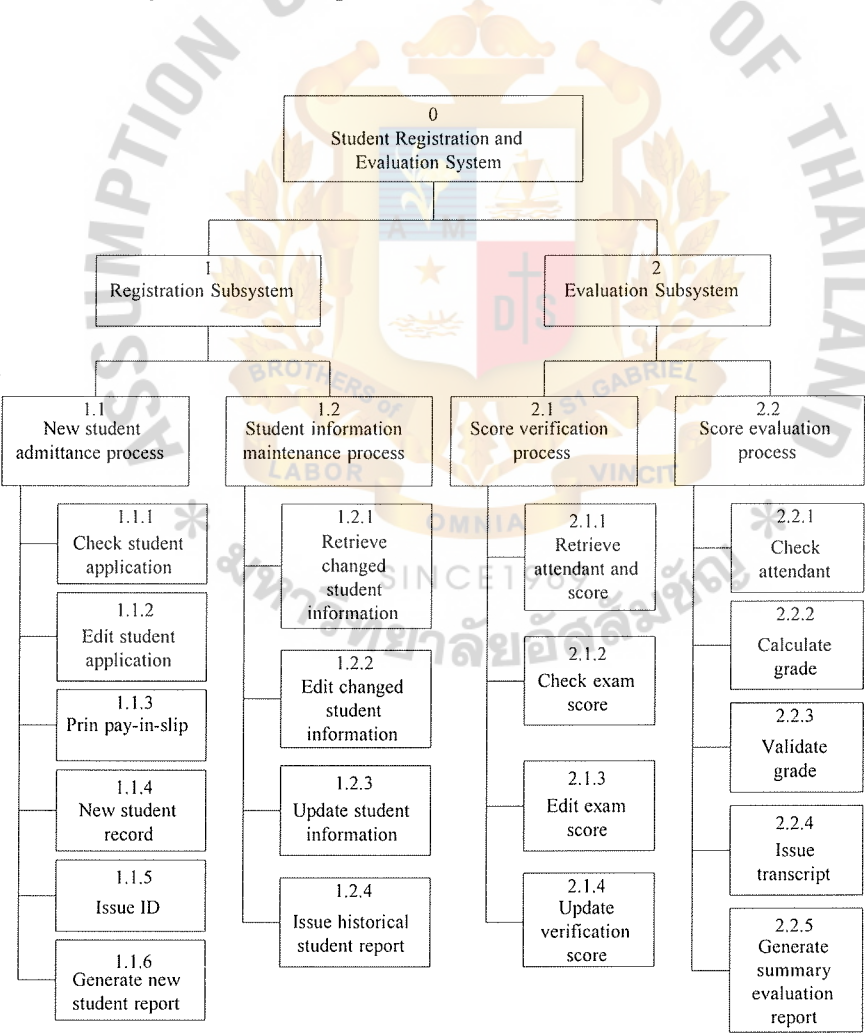
Figure 3.2. Functional Decomposition of Proposed System.

17

The Student Registration and Evaluation System consists of two major subsystems. They are registration and evaluation subsystems. Each subsystem comprises many processes with distinct functionality. The brief description of each subsystem is explained as follows.

(1)   Registration Subsystem

The first process under registration subsystem is Admit new student process. The staffs of the registration department receive the student applications from students and check them. If student applications are incomplete, they will edit student applications completely and then record the new student information into database. After that staff generate ID cards for new students including summarizing and generating summary reports for the dean. The other process under registration subsystem is maintenance student information process. When students change the student information or graduate, the staff will update student information in the database and generate the historical student reports and summary report for dean.

(2)   Evaluation Subsystem

The first process under evaluation subsystem is Score verification process. After students exam the examination in each semester, teacher in each room will send exam score to evaluation department. Staff of this department check, edit and record verified exam score into database. The other process under evaluation subsystem is Evaluate exam score process. At the end of each semester, staff check attendant data of school in order to consider attendance of each student. Then they calculate grade, verify them and update into database. After that they announce the resultgrade to students and teachers. Furthermore, staff generate transcripts of students and summarize report to dean.

Grading criteria: Grades are used to show the academic standing of all students with the following meanings and score range.

Number Grade	Meaning	Score Range
4	Excellent	80-100
3	Very Good	70-79
2	Fair	60-69
1	Poor	50-59
0	Failure	0-49
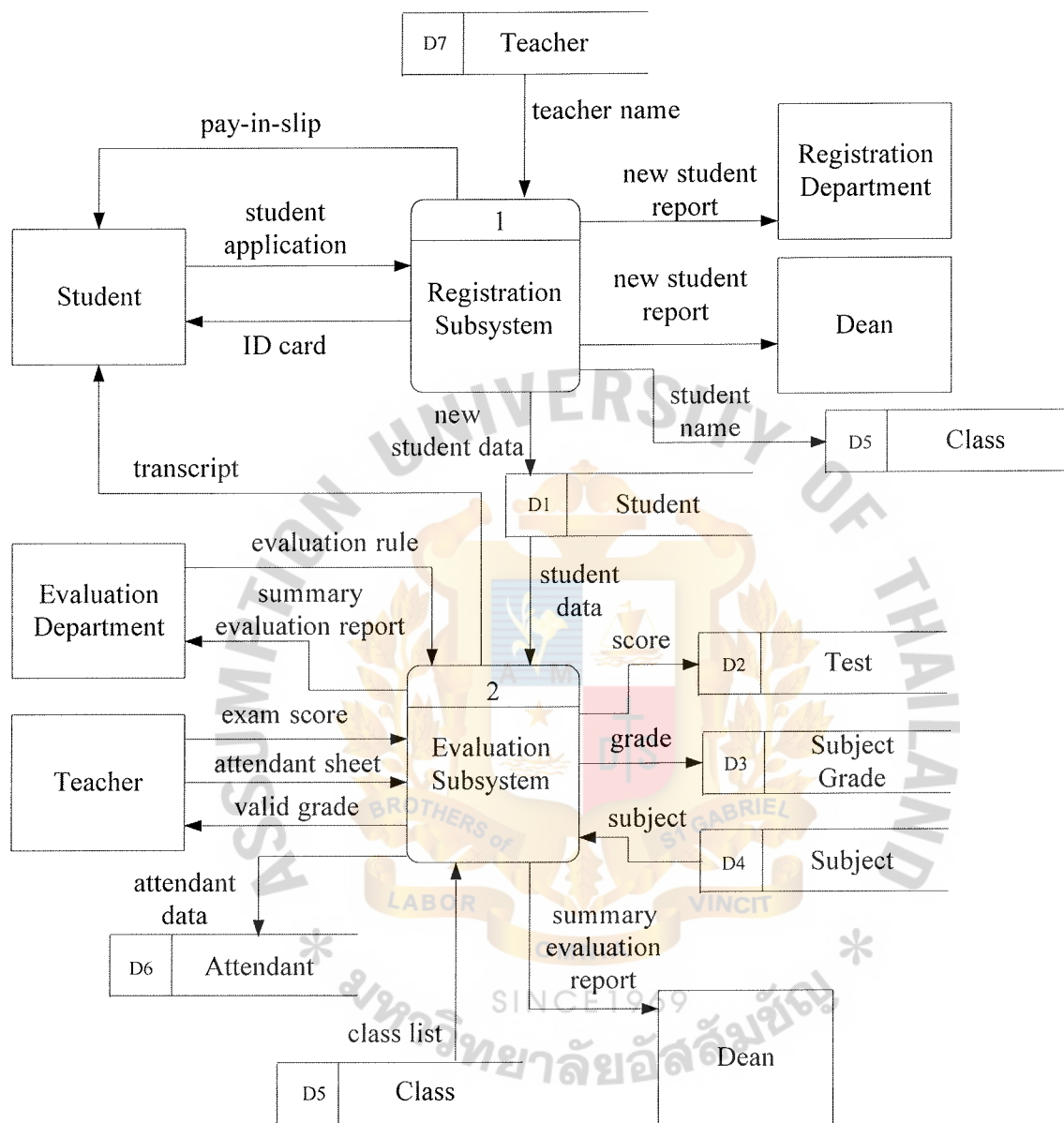
Figure 3.3. Data Flow Diagram of the Proposed System

20

3.3   System Design

3.3.1 Candidate Solution Analysis

After the existing system is identified and analyzed business requirements in requirement analysis phase, the alternative candidate solutions that might solve the problem and fulfill the business requirements must be identified and analyzed.

(1)   Candidate 1: Novell Netware 4.12 & MS Visual Foxpro 6.0

Novell Netware is Netware Directory services (NDS) which is a special purpose name service that enable you to find and use network resource and data as a single integrated system. It is more powerful, scaleable and flexible than other network OS available. MS Visual Foxpro 6.0 is a powerful relational DBMS, which allows developers to easily include menus, popups and pulldown in their programs.

MS Visual Foxpro is the software development system that developers do not develop in this moment. However, it is easy to implement because it can create the parts of a program that a user will interact with user interface easily like MS Visual Basic.

(2)   Candidate 2: Oracle Developer 2000 & Personal Oracle 8.0

Oracle Developer 2000 is an application development tool, and Personal Oracle 8.0 is efficient DBMS with a flexible application development tool. Oracle is a database for handling large data requirements, which it is difficult to use and implement. Oracle supports the multi-user environment and relational database technology based on SQL. Oracle targets high-end workstations and minicomputers as the server platforms on which to run its database systems.

21

Since the existing programmers have a little experience about oracle product, the training course is required to guide them in developing the new application with a powerful database server. However, this candidate provides the best way of developing the new system by introducing an effective development tool and database software.

(3)   Candidate 3: MS Visual Basic 6.0 & MS SQL Server 7.0

Ms Visual Basic 6.0 is a software development system developed by Microsoft to support creating programs for the Window OS. Their availability (form, combo-box, check-box) in the VB development system make it very easy to create the parts of a program that a user will interact with user interface. For DBMS, MS SQL Server 7.0 is selected because it is a high performance, multi-user, relational database server based on SQL. And it is a standard DBMS for Windows platform that scales from a laptop database to enterprise-wide databases

This candidate is easy to use and implement because Visual Basic is easy to learn and fast to write code with, it's sometimes used to prototype an application that will later be written in a more difficult but efficient language. Visual Basic is also widely used to write working programs.

The candidate solution of proposed system is illustrated by the Candidate System Matrix which is used to provide overview characteristics of each alternative candidate solution as shown in Table 3.1.

22

Table 3.1.   Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of the portions of the system that would be computerized in this candidate.	Fully supports all relevant units that are involved in registration and evaluation process	Same as candidate 1	Same as candidate 1
Benefits Brief description of the business benefits that would be realized for this candidate.	Application development is easy with fast learning time and low maintenance	Powerful DBMS and application that perform tasks more efficiently	Application development and implementation is easy with fast learning time
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Server : Pentium IV 2.0 GHz PC : Pentium IV 1.6 GHz	Same as candidate 1	Same as candidate 1
Software tools needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating system, languages etc.) Not generally applicable if applications software packages are to be purchased.	Novell Netware 4.12 Window 98 SE MS Foxpro 6.0	Windows 2000 Server Window 98 SE Developer 2000 Personal Oracle 8.0	Windows 2000 Server Window 98 SE MS Visual Basic 6 MS SQL Server 7.0
Application software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom Solution	Same as candidate 1	Same as candidate 1
Method of data processing Generally some combination of: online, batch, deferred batch, remote batch, and real-time.	Database stored on File server	Oracle uses a two-tier Client/Server architecture with powerful database server	Database stored on server and processed on workstation
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted form, etc.), and output considerations (e.g. timing of actual inputs)	Display Monitor HP laser 6P printer	Same as candidate 1	Display Monitor HP laser 6P printer on print server
Input Devices and Implications A description of input methods to be used, input devices (e.g. keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input) and input considerations (e.g. timing of actual inputs)	Keyboard and mouse Barcode reader	Same as candidate 1	Same as candidate 1
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized.	Novell Netware with 40 GB storage capacity	Oracle DBMS with 40 GB storage capacity	MS SQL Server DBMS with 40 GB storage capacity

3.3.2 Feasibility Analysis

After the candidate solutions are identified and analyzed in each characteristics, the feasibility analysis should be analyzes later. The four categories of feasibility tests as following:

(1) Operational feasibility

It is a measure of how well the solution will work in the organization. It is also a measure of how people feel about the system/project. All candidates are fully supporting the user requirements but candidate 2 is the most feasible because it operates the process more powerful and efficiency than other candidates.

(2) Technical feasibility

It is a measure of the practicality of a specific technical solution and the availability of technical resources and expertise. Candidate 2 is the most difficult to implement because staffs have a little experience about its development tool, whereas other candidates are easy to implement and design.

(3) Schedule feasibility

It is a measure of how reasonable the project timetable is. That means, the solution can be designed and implemented within an acceptable period or not. Candidate 3 takes only five months to develop and implement.

(4) Economic feasibility

It is a measure of the cost-effectiveness of a project or solution. It uses cost benefit analysis technique to determine the economic feasibility. Candidate 3 is the most economical as it consumes the smallest amount of investment with shortest payback period.

24

From all feasibility criteria that has been evaluated, candidate 3 is the most suitable alternative solution for the proposed system because it takes the lowest development time and cost with acceptable performances. The feasibility analysis results are shown in Table 3.2.

Table 3.2.   Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be by user management, user, and organization perspective.	30%	Fully supports the user requirements because additional software is not required for client PC. Score: 85	Fully supports the user requirements in term of both functionality and business process. Furthermore, it provides a space for further development. Score: 95	Fully supports the user requirements and implementation in term of both functionality and business process. Score: 90
Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	20%	Foxpro is not the database server but it is the data sharing, then data is inconsistency in term of many transactions. Score: 85	Oracle is the leading DBMS software that provides high efficiency. Programmer requires the continuous training course for operating and maintaining system. Score: 75	MS SQL Server and MS Visual Basic work compatible because both products using similar DBMS. Score: 90
Economic Feasibility Cost to develop (Baht): Payback period (discount): Net present value (Baht): Detailed calculations:	30%	Approximately 582,100 Approximately 3.26 Years Approximately 459,792 (See Appendix G) Score: 90	Approximately 654,400 Approximately 4.09 Years Approximately 227,405 (See Appendix G) Score: 80	Approximately 451,600 Approximately 2.81 Years Approximately 538,029 (See Appendix G) Score: 95
Schedule Feasibility An assessment of how long the solution will take to design and implement.	20%	Approximately 6 months Score: 80	Approximately 7 months Score: 70	Approximately 5 months Score: 90
Ranking	100%	85	80	91.25

25

3.3.3 System Architecture

The overall architecture for an information system, there are fundamental information technology decisions to be made regarding Data, Process, Interface and Network.

(1)   Data Architecture

As a shared resource, the centralized data is easier to manage because of centralized control. In globalization, the technology is getting more advanced that it is possible to distribute data without loss of centralized control. This can be achieved through the distributed relational database. The proposed system uses Microsoft SQL Server as the Distributed Relational Database System (Distributed RDBMS) which is a software program that controls access to and maintenance of the stored data in the relational format. It also provides a more sophisticated backup, recovery, security, integrity and processing. It reduces the data traffic on the network.

In the database, we use data replication in order to store all data into all clients. When we want to update, delete or insert, we do so in only one client. Then the data is automatically changed.

(2)   Process Architecture

The process architecture of an application is defined in terms of the software language and tools that will be used to develop the application programs for the process. Software development environment (SDE) is a language and tool kit for constructing information system applications. In the proposed system, we uses Microsoft Visual Basic as a SDE which consists of a client-based programming language with built-in SQL connectivity to one server database engines. It provides Rapid application development (RAD) for quickly building the graphical user interface (GUI), connectivity for

26

various relational database engine and interoperability with those engines, automatic generation of the template code for the GUI, sophisticated code testing and debugging environment for the client.

(3) Interface Architecture

This is the fundamental architectural decision that they have to make regarding the inputs, outputs and intersystem connectivity. The proposed system will contain all user interface and business logic on clients. On-line processing is used because it provides the interactive transaction conversational dialogue between users and computer applications. Errors are identified and corrected more quickly because there is no time lapse between data entry and input. The format of input and output can be done in an on-line mode. So, the data that they receive will be an update on and ready for making a decision. As the product of Microsoft Visual Basic provide us with easy to build user-friendly interface, we can easily build the desire interface by dragging and dropping the command button, text box, option button and etc.

(4) Network Architecture

In the existing system, the network infrastructure does not constructed because the school has a few stand-alone PCs to store information. For the proposed system, the network infrastructure of the school is based on Local Area Network (LAN) with star topology. This system has a server, which will store database that is accessed by the client PC through LAN. This architecture is known as Two-Tiered Client/Server. It also provides the service for backup, recovery and security.

In the star topology, each computer is directly connected to a common central node. Each computer attaches to a central node via two point-to-point

links. The central node acts as a frame-switching device. An incoming frame is buffered in the node and then retransmitted on one outgoing link to the destination computer. In this system uses switching hub as a central node which avoids collision of data frame.

3.3.4 Structure Design

This is the technique which deals with the size and complexity of a program by breaking up the program into a hierarchy of modules that result in a computer program that is easier to implement and maintain. It designs a program as a top-down hierarchy of modules. The resulting hierarchy of modules can be evaluated accordingly to certain quality acceptance criteria to ensure the best modular design for the program.

The primary tool used in structure design is the Structure Chart. It is used to depict a modular design of a program. It shows how the program has been partitioned into smaller, more manageable module, the hierarchy and organization of those modules and the communication interfaces between modules but it does not show the internal procedures performed by the module or the internal data used by the module.

Once the data flow diagram has been revised, a structure chart can be derived. The output of this technique is Partitioned Data Flow Diagram and Structure Chart, which is exhibited in Appendix C.

3.3.5 Process Specification

The purpose of a process specification is to define what the system does to transform inputs into outputs. It provides the details of system processes in table format, which is easier to look at all, related input, output and relevant processes than in a diagram. It describes the data, process and interface for each process. The process specification of the proposed system is illustrated in Appendix D.

3.3.6 Database Design

The goals of database design are as follows:

(1) A database should provide for the efficient storage, update and retrieval of data.

(2) A database should be reliable, that is the stored data should have high integrity to promote user trust in that data.

(3) A database should be adaptable and scalable to new and unforeseen requirements and applications.

In the proposed system, Database should be designed to Normalization, that is a technique for organizing data attributes such that they are grouped to form non-redundant, stable, flexible and adaptive entities. Normalization is a three-step technique that places data model into first normal form, second normal form and third normal form. Database design for proposed system is shown in Appendix E.

3.3.7 Documentation

For documenting the design of the proposed system, data dictionary should be prepared. Data dictionary is an organizing listing of all the data elements that are pertinent to the system, with precise, rigorous definitions so that both user and system analyst will have a common understanding of all inputs, outputs components of and intermediate calculations. The data dictionary for entity relationship diagram and data flow diagram is shown in Appendix F.

3.3.8 Input Design

Input design of the proposed system comes from the users' requirements. From the user interview sections, the input design must follow the conclusion that the system must be user-friendly because the users are familiar with the old-style paperwork. Moreover, the input design must be very efficient. That is, the users should not have to deal with enormous amount of the information that they have to enter. This action will make input

29

processes more efficient and the users will spend less time entering the information. The input data should cover all required information following the database design. Some of the existing forms and reports contain excessive information, so it may not included in the input of the system or in the database.

The proposed system uses Microsoft Visual Basic as a development tool. This tool is able to generate a GUI-based system, Object Oriented Application. That is, it eliminates the task of creating the screen like the old-style conventional programming languages. The main input object is called a form. The form enables users to enter the information by filling the textbox or other easy-to-use objects. Thus, this eliminates the confusing input screens that are full of texts. The input screens of the proposed system are shown in the Appendix H.

3.3.9 Output Design

The output of the proposed system mainly deals with reports. As mentioned earlier, the report requirements come from the users' requirement. First, the system must be able to produce the existing reports that are presently done by dedicated officers. They have to type all the reports from the request of any department in the school. The users also have a new kind of report that they have just discovered, so the proposed system has to able to produce those reports.

The output design is to design the reports that should not be complicated. They should contain enough information, and be in the easy-to-read format. The reports should contain accuracy of the information, which is retrieved from the table and calculated from the existing data. Some of the reports are not only distributed internally, but are also distributed to other official organizations such as the ministry of education and other school, so error data may damage the school's reputation. The report designs are shown in Appendix I.

3.4 Hardware/Software Requirements

The Registration and Evaluation System of an Elementary School consists of a computer server that stores the database for the system and backup of programs.

The server must have hardware specification that can run Microsoft Windows 2000 and Microsoft SQL. The hardware and software specifications for the server are shown in the Table 3.3 and Table 3.4 respectively.

Table 3.3.   Hardware Specification for Database Server.

Device	Specification
Processor Type and Speed	Intel Pentium IV 2.0 GHz or higher
Cache Memory	512 KB
Primary Memory	DDR 512 MB
Hard Drive Capacity	Ultra 160 SCSI 18.4 GB (5 quantities)
I/O Controller	Intel RAID SCSI Controller
CD-ROM Drive (X)	52X or higher
Floppy Drive	3.5" 1.44 MB
Network Adapter	3com Fast EtherLink XL 10/100 Mb
Display Monitor	HP LCD 15"
UPS	APC 1 KVA
Printer	HP Laser 6P

Table 3.4.   Software Specification for Database Server.

Software	Specification
Operating System	Microsoft Windows 2000 Server (Service Pack 2)
Application Software	Microsoft Visual Basic 6.0
Database Server	Microsoft SQL Server 7.0

31

The Registration and Evaluation System needs two client machines for Registration office and Evaluation office and one client machine for Financial office. All computers must be connected with three laser printers on local area network (LAN). The Microsoft Windows 98 SE is served for all client computers and the development tool is Microsoft Visual Basic 6.0. The hardware and software specifications for the each client machine are shown in the Table 3.5 and Table 3.6 respectively.

Table 3.5.   Hardware Specification for Each Client Machine.

Device	Specification
Processor Type and Speed	Intel Pentium IV 1.6 GHz
Cache Memory	256 MB
Primary Memory	DDR 256 MB
Hard Drive Capacity	40 GB
Floppy Drive	3.5" 1.44 MB
Network Adapter	3Com Fast EtherLink XL 10/100 Mb
Display Monitor	HP LCD 15"
Printer	HP Laser 6P

Table 3.6.   Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 98 SE
Application Software	Microsoft Visual Basic 6.0

3.5 Network Configuration

In order to connect the database server and the client machine together, the network can be established through the local area network (LAN). LAN with database server will be the most appropriate networking because they provide less traffic on the network. For the topology network infrastructure of the proposed system uses Star Topology. Each computer is directly connected to a common central node, referred to as the switching hub. The network configuration of the proposed system is shown in Figure 3.4.
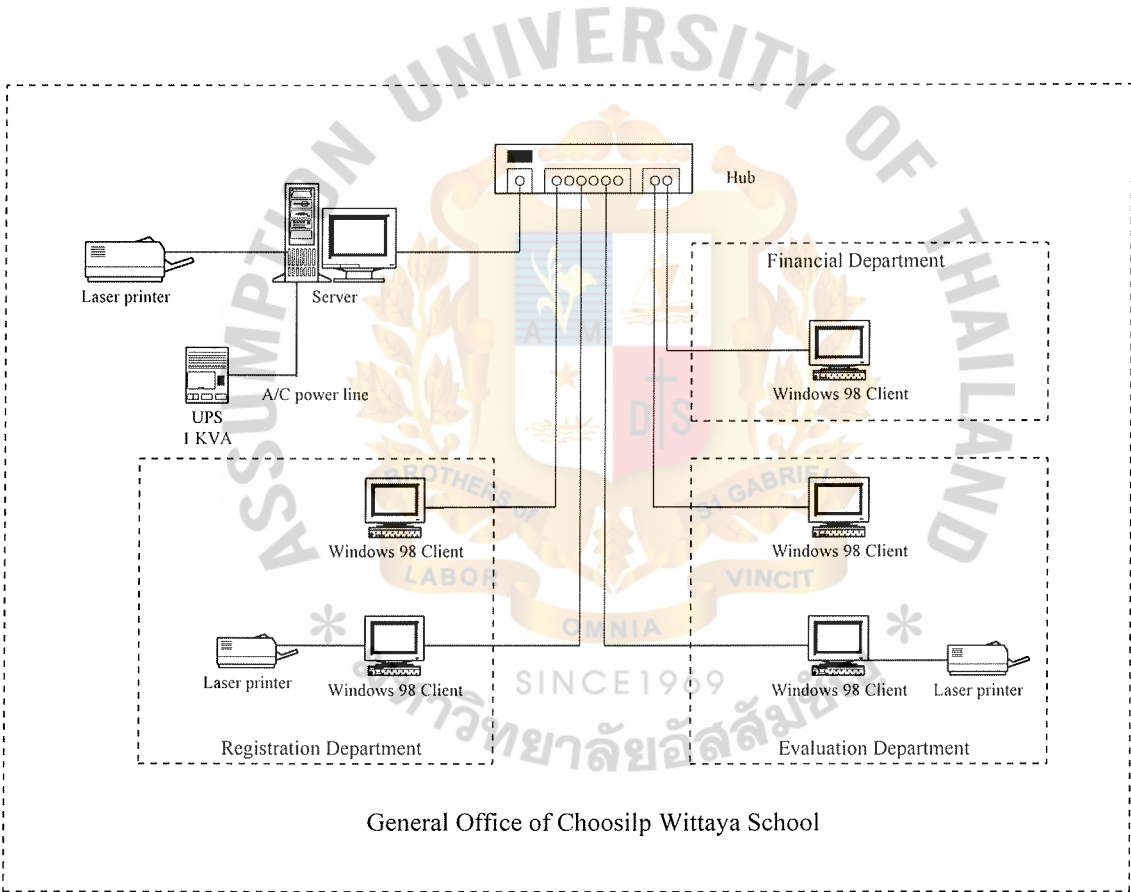
Figure 3.4. Network Configuration of the Proposed System.

From the above network configuration, the proposed system has the following network peripheral devices shown in Table 3.7.

Table 3.7.   Network Peripheral Devices of the Proposed System.

Network Peripheral	Specification
Network topology	Star topology
Hub	Switching Hub 10/100 Mbps
Card	Network interface card
Interconnection	3Com 10/100 Mbps
Wiring and cable	UTP 4 pair CAT5

3.6   Security and Controls

Security and control policies are needed in the information system because the information is important for the organization. It must be protected from the risk or unauthorized access. The proposed system must apply the proper security and control policies to prevent unauthorized access or alteration to the system.

The registration and evaluation systems are very important, and can be viewed as the most important function of the school. It keeps a lot of important information such as student information, exam score and grade. The information will be given to the appropriate people only. Unauthorized access to the system must be prevented. The unauthorized people may want to change information or disclose important information to gain some benefit from the information. There are three parts of security and control policies has been designed in the proposed system as follows:

(1)   Physical Security

Physical security is the term used to describe protection provided outside the computer system.

34

(a)   Access Control

Access to the computer room should be controlled by both security guards and door locks. Security guards should utilize close-circuit television to monitor activity outside the building, inside the building around the computer room, and in the computer room. Door locks can require the person wishing to gain access to insert a magnetically encoded ID card or enter a lock combination into a keypad.

(b)   Backup and Recovery

Back up and recovery are more important for the information system because of organizations are demanding higher throughput as they continue to store and process more data. In multiple server networked environments, backup solution are most often network-based, rather than being done on an individual, server-by-server basis. For this proposed system, uses RAID technology which is numerous small disk drives are joined together in arrays and controlled by software that make them appear as one gigantic disk to server operating system. This technology can protect important data loss from disaster or unauthorized access.

(2)   Logical Security

The logical security policy of the proposed system is separated into 3 levels as follows:

(a)   Identification

As the first process, identification provides a way of identifying a user, typically by having the user enter a valid user name before access is granted. It must have the unique login name or user ID of

both users and administrators. Once the users want to access the system, they have to supply their login name This is the identification method of the proposed system to tell the system who claim to be.

(b)   Authentication

Authentication is the process of determining whether someone or something is, in fact, who or what it is declared to be. In private and public computer networks (including the Internet), authentication is commonly done through the use of logon passwords. Knowledge of the password is assumed to guarantee that the user is authentic. Each user registers initially (or is registered by someone else), using an assigned or self-declared password. On each subsequent use, the user must know and use the previously declared password. The weakness in this system for transactions that are significant (such as the exchange of money) is that passwords can often be stolen, accidentally revealed, or forgotten.

To protect from unauthorized accesses in this proposed system, each user must log on to the computer by unique user name and password in order to access to the system. They can access only their task program. Setting menu for each user to log into the system depends on related functional tasks. This ensures that casual users can not access to the performance of the database.

(c)   Authorization

Following authentication, a user must gain authorization for doing certain tasks. After logging into a system, for instance, the user may try to issue commands. The authorization process determines whether the

36

user has the authority to issue such commands. Simply put, authorization is the process of enforcing policies: determining what types or qualities of activities, resources, or services a user is permitted. Usually, authorization occurs within the context of authentication. Once you have authenticated a user, they may be authorized for different types of access or activity.

Authorization is the process of giving someone permission to do or have something. In multi-user computer systems, a system administrator defines for the system which users are allowed access to the system and what privileges of use (such as access to which file directories, hours of access, amount of allocated storage space, and so forth). Assuming that someone has logged in to a computer operating system or application, the system or application may want to identify what resources the user can be given during this session. Thus, authorization is sometimes seen as both the preliminary setting up of permissions by a system administrator and the actual checking of the permission values that have been set up when a user is getting access.

(3)   Administration Control

Administration Control is the human side of computer security. There are two control parts as follows:

(a)   Segregation of Duties

Segregation of Duties involves ensuring that individuals do not perform incompatible duties. Duties are considered incompatible from a control standpoint when it's possible for an individual to commit an error or irregularity and then be in a position to conceal it in the normal

37

course of his duties. This control uses another person authorized or approved the data before update data in order to protect error data.

(b)   Dual Control

The Superuser can authorize login name and password of normal users. In order to protect the system, the superuser improves data, auditor just knows half the password and the superuser knows another half password of users.

Both Segregation of Duties and Dual control is called "four-eyes system" which is controlled by two persons.

3.7 Cost and Benefit Analysis

The cost and benefit analysis is used to determine whether the project is worthwhile. The average inflation rate is forecasted to be 10% throughout the next five years. Following are details of cost for the new computerized system compared to the existing manual system.

3.7.1 Cost Analysis

(1) Cost of the existing system

The existing system is operated manually and incurs both fixed cost and operating cost. The fixed cost is only office equipment cost and operating cost is salary cost, office supplies and miscellaneous costs. Since the existing system is manual, there are many persons to operate more tasks and produces much paperwork. They cause the operating cost to be very high when compared with the computerized system.

All cost in the existing system will increase by 10% per year with an exception of personnel cost, which will grow only by 5% per year. The detailed calculation of the existing system cost is shown in Appendix G. For the summarized cost of the existing system is presented in Table 3.8.

Table 3.8. Summarized Cost of the Existing System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
Fixed Cost	60,000	66,000	72,600	79,860	87,846
Operating Cost					
1. Personnel Cost	1,650,000	1,732,500	1,819,125	1,910,081	2,005,585
2. Office Supplies & Miscellaneous Cost	260,000	286,000	314,600	346,060	380,666
Total Annual Operating Cost	1,910,000	2,018,500	2,133,725	2,256,141	2,386,251
Total Manual System Cost	1,970,000	2,084,500	2,206,325	2,336,001	2,474,097

Table 3.9.   Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	1,970,000	1,970,000
2	2,084,500	4,054,500
3	2,206,325	6,260,825
4	2,336,001	8,596,826
5	2,474,097	11,070,924
Total	11,070,924	-

(2)   Cost of the proposed system

In developing the proposed system, there are two costs, system development cost and system operating system. These cost are expected to increase by 10% per year with an exception of personnel cost, which will grow only by 5% per year. The detailed calculations of each candidate solution cost are shown in Appendix G. For the summarized cost of the proposed system is presented in Table 3.10.

Table 3.10. Summarized Estimated Cost of the Proposed System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost	67,000	67,000	67,000	67,000	67,000
Server 1 Set @ 125,000 Baht	25,000	25,000	25,000	25,000	25,000
Client 5 Set @ 200,000 Baht	40,000	40,000	40,000	40,000	40,000
UPS 1KVA 1 Unit @ 10,000 Baht	2,000	2,000	2,000	2,000	2,000
2. Software Cost	10,100	10,100	10,100	10,100	10,100
Server 3 License @ 30,500 Baht	6,100	6,100	6,100	6,100	6,100
Client 1 License @ 5,000 Baht	1,000	1,000	1,000	1,000	1,000
3. Peopleware Cost	315,000	0	0	0	0
4. Implementation Cost	59,500	0	0	0	0
Total System Development Cost	448,600	74,100	74,100	74,100	74,100

Table 3.10. Summarized Estimated Cost of the Proposed System, Baht. (Continued)

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Cost					
1. Maintenance Cost	56,000	61,600	67,760	74,536	81,990
2. Personnel Cost	1,488,000	1,562,400	1,640,520	1,722,546	1,808,673
3. Office Supplies &					
Miscellaneous Cost	155,000	170,500	187,550	206,305	226,936
Total Annual Operating Cost	1,690,000	1,784,600	1,884,940	1,991,408	2,104,422
Total Computerized System Cost	2,138,600	1,858,700	1,959,040	2,065,508	2,178,522

Table 3.11. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	2,138,600	2,138,600
2	1,858,700	3,997,300
3	1,959,040	5,956,340
4	2,065,508	8,021,848
5	2,178,522	10,200,370
Total	10,200,370	-

(3)   Comparison of system cost

After both the existing system cost and proposed system cost are identified, the comparison of manual and computerized cost is constructed to evaluate the cost saving from implementing the proposed system. The comparison of manual and computerized cost is shown on Table 3.12.

Table 3.12. The Comparison of Accumulated Cost of the Existing System and the Proposed System, Baht.

Year	Accumulated Cost of Existing System	Accumulated Cost of Proposed System
1	1,970,000	2,138,600
2	4,054,500	3,997,300
3	6,260,825	5,956,340
4	8,596,826	8,021,848
5	11,070,924	10,200,370

3.7.2 Benefit Analysis

Benefits normally increase profits or decrease costs, both highly desirable characteristics of the new information system. There are two types of the benefits as following:

(1) Tangible Benefits

Tangible benefits are those that can be easily quantified which are usually measured in terms of monthly or annual saving or of profit to the organization. Alternatively, tangible benefits might be measured in term of unit cost saving or profit. The tangible benefit of the proposed system is shown on Table 3.13.

Table 3.13. Tangible Benefit of the Proposed System, Baht.

Benefit Items	Year 1	Year 2	Year 3	Year 4	Year 5
1. Personnel Reduction	462,000	485,100	509,355	534,823	561,564
2. Operating Time Saving	1,044,000	1,148,400	1,263,240	1,389,564	1,528,520
3. Office Supplies Expense Reduction	114,000	125,400	137,940	151,734	166,907
4. Expense Saving	268,000	294,800	324,280	356,708	392,379
Total Benefits of computerized system	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370

(2)   Intangible Benefit

Intangible benefits are those benefits believed to be difficult or impossible to quantify. Example of intangible benefits are improved customer goodwill, improved employee moral, better service to community and better decision-making.

3.7.3 Cost and Benefit Analysis Technique

(1)   Break-even Analysis

Break-even Analysis is a technique that is used to find the period that accumulative cost of existing system is equal to accumulative cost of proposed system. The point that they are equal is called break-even point. It represents when the system becomes profitable for the business. The break-even point of the proposed system is depicted on Figure 3.5. The proposed system cost is less than the existing system cost when the time passes a half-year.
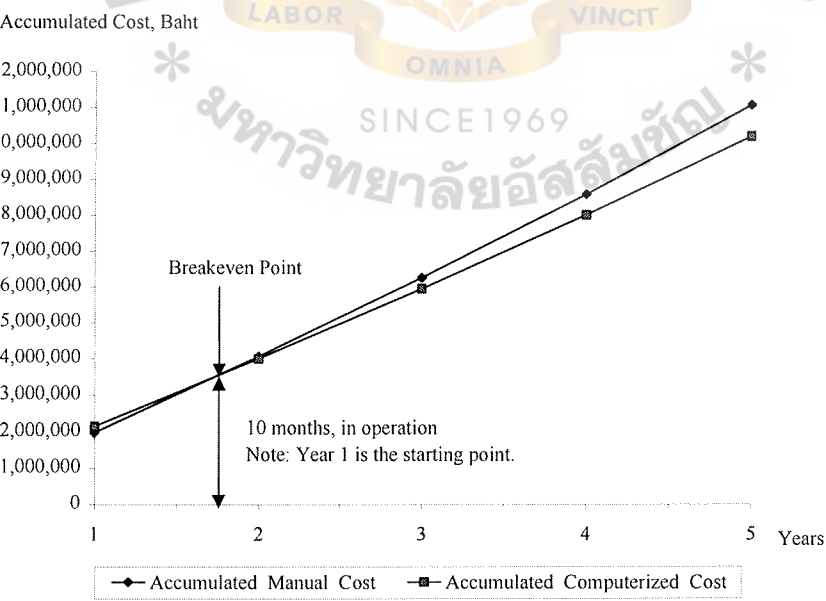
Figure 3.5.   Break-even Analysis.

43

(2)   Payback Analysis

Payback Analysis is a simple and popular technique for determining if and when an investment in the project will pay for itself. On the other hand, it determines how much time will lapse before accrued benefits overtake accrued and continuing costs. This period time is called payback period. In this project, the discount rate is assumed to be 10%. Figure 3.6 shows the payback period of the proposed system that has already been calculated to evaluate the candidate solution. For the full details of payback calculation are in Table G.8 on Appendix G.
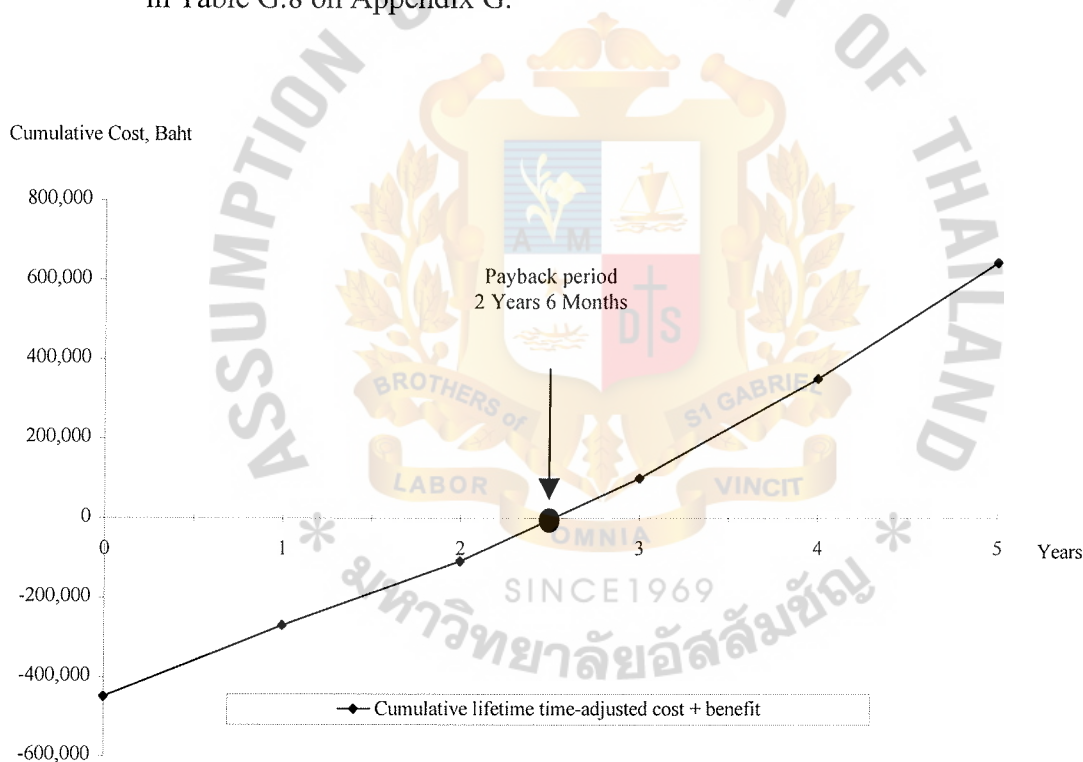
Figure 3.6. Payback Analysis.

44

(3)   Net Present Value

The net present value of an investment can determine whether the project or the proposed system is worth developing or not. If the net present value of the system is positive, it means the investment is good. Otherwise, the system should not be implemented. When comparing multiple solutions or projects, the one with the highest positive net present value is the best investment. For the full details of Net Present Value are in Table G.11 on Appendix G.

After doing several cost-benefit analysis techniques, it can be concluded that the proposed system is worth developing. From the payback analysis it can be seen that the payback period of the system is approximately less than three years. That is, the benefits of the system will over take the costs after the system has been developed and used for three years. This is a very short pay back period. Moreover, the net present value of the system is positive. In conclusion, the proposed system is a good investment for the school.

IV. PROJECT IMPLEMENTATION

4.1   Overview of Project Implementation

After the system analysis and system designs are complete, the next one that we must consider is the system implementation, which is the most important point that will determine it is success or failure. To maximize efficiency and productivity, the system elements should be fine-tuned. If the technical design and prototypes are approved, the system implementation is performed.

The implementation process is set up basing on the parallel run concept. By applying this concept, the process will work on both the manual system and the computerized system for a period of time until the operation of the computerized system has been proved to be profitable. During the period, the users have to do double jobs on the manual system and on the computerized system everyday so that the users can get used to the new system. It will not take a long time for the users to get used to new system, as the new system process is designed based on the routine jobs of the current system.

The major function of implementation process is to physically implement all designs to become the real thing. Programs that support the workflow have to be created. All input/output screens and report layouts are also generated to support the designed workflow. After the developers have tested the programs, the user training has to be conducted in order to train the users how to use the system efficiently and correctly so that users can test the system by themselves. After testing, if the users are not satisfied with the system, they can ask the system developers to correct the system until they find it acceptable it.

The processes of system implementation of the proposed system are presented in brief details as follows:

(1) Hardware and Software Acquisition and Installation

(2) Personnel Training

(3) Site and Data Preparation

(4) System Testing

(5) Conversion

4.2 Stages of Project Implementation

The competent application of analysis and design techniques alone is hardly sufficient to ensure a successful system. Once the analysis and design are complete, we must go on to construct the new system. The construction phase includes the tasks of coding, testing and optimizing for efficiency. Meanwhile, the user must be trained and the site must be readied for the computer. Later, during the conversion phase, all data must be transferred to the new system, and the new system put into operation. The maintenance phase of the system development life cycle includes daily maintenance in the form of testing and verification that the system is working properly. If defects of deficiencies are found, modifications to the system may be required.

Analysts continue to be associated with a system throughout these later phases of its system development life cycle. They may supervise coding, testing, optimization and site preparation, as well as being more actively involved in user training and conversion. Later, during the maintenance phase, analysts usually investigate the implementations of any proposed change, then supervise the implementation of the change once it is approved.

47

4.3 Training and Documentation

Before the new system is fully implemented, the training and documentation must be prepared for the system users. It is necessary for the company to sacrifice its own staff's time for application training. Users should be trained to use system properly. They must understand thoroughly which part (s) of the system is under whose responsibility, who has rights of access, modification, deletion, and/or updating the data in the new system. The training session should be in-groups to encourage group learning possibilities. In addition, the user manual should provide guidelines for system users on how to operate the system including all system functions.

4.4 Conversion

The parallel conversion is used in this system in order to convert the old system to the new system. Both the old and new systems must be operated for some time period. This will ensure that all major problems in the new system have been solved before the old system is discarded, in order to possible check new data against old data in order to identify if there is any error in processing in the new system. Parallel processing also offers a feeling of security to users, who are not forced to make an abrupt change to the new system.

4.5 System Support

Once the proposed system is operating, it delivers the business solution to the user community. It will still require ongoing system support for the remainder of its life. System support is the ongoing technical support for users, as well as the maintenance required to fix any errors, omissions or new requirements that may arise. Typically, this activity includes program maintenance, system recovery, technical support and system enhancement. The four major areas of system support are as follows.

(1) System Maintenance

It is actually the corrective action taken when some errors or bugs are identified in the system. These bugs may be caused by the miscommunication of the requirements or the design flaws. Some are even caused by the unanticipated situations, which were therefore not tested. Therefore, testing must be done to ensure that program fix will not adversely affect the system operation.

(2) System Recovery

When a system failure is inevitable, it generally results in an aborted program and loss of data. Thus, a system recovery must be specified to identify the roles and responsibilities of each unit in the system. It aims to restore a system's file, database and to restart the system.

(3) Technical support

This is the routine ongoing activity of system support. Users still requirement assistance in day-to-day operation of the system. The most tasks include the observing the use of the system, conducting user satisfaction survey and meeting, changing business procedure, providing additional training, logging enhancement ideas and requests in the repository.

(4) System Enhancement

This is an adaptive process which adapt an existing system to new requirements is the norm for all information systems. The objective is to modify the proposed system to respond to the new requirement, technology and maintenance cost.

V.   CONCLUSIONS AND RECOMMENDATIONS

5.1   Conclusions

Choosilp Wittaya School, Elementary school, is in its developing stages, giving more importance to elementary education in order to develop attitude, knowledge and skills of students. There is an increasing number of students every year. As a result, Choosilp Wittaya School needs to improve the information system to support the growth of students by implementing the new system instead of using the conversion that cannot support the needs of the school.

In the existing system, all tasks are done manually. The problems that usually occurrence human errors, data redundancy, slow response time including high operating cost. The proposed system will solve the mentioned problems and improve the current operation. The project is to analyze, design and develop the system in order to handle and manage information. The school has planned for conversion from the restricted system to the new computerized system. The computerized system can replace the existing system with high performance and more productivity. The registration and evaluation system is chosen to be the first system to be converted because this system is the most important system for school management. It directly deals with the students, the most important entity in the school. After the proposed system works well, other system such as Financial Department and also other departments will be developed.

The proposed system can help to reduce human errors, response time to users and operating costs. In the cost and benefit analysis section, the summarized cost table reveals the fact that the proposed system incurs less operating cost than the existing system. The breakeven point, for the existing system is less than the cost of the proposed system during the first years because the proposed system incurs initial development costs in the

first year of its implementation, but after the second year the cost of the proposed system will be less than the cost of proposed system because the benefit will be explored.

The advantages of the proposed system for management in planning, making decision and controlling information for the school are more efficient and effective than the existing system in the following:

(1)   The new system is more efficient because it improve accuracy and timeliness of information. It can help the top executive and dean make better decisions and manage more effectively.

(2)   The new system is more flexible due to use of structured design. Hence, it is easy to maintain and expand to meet the future growth of the school.

The proposed system also spends less time to operate than the existing system. This fact is illustrated in the following additional table.

Table 5.1.   The Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
New student admittance	30 Minutes	3 Minutes
Student information maintenance	30 Minutes	3 Minutes
Score verification	15 Minutes	3 Minutes
Score evaluation	15 Minutes	1 Minute

The details of how implementation of the proposed system can improve the operating time of each process can be summarized as follows:

(1) New student admittance: The existing system spends 30 minutes to record the student data into MS Excel. In contrast, the proposed system provides the graphical user interface which easy to input student data into database.

(2) Student information maintenance: The existing system spends 30 minutes to maintain information of student because staffs have to find and review the information in the changed student form before recording data into MS Excel. With the new system, the program can searching student data and update immediately.

(3) Score verification: The existing system consumes 15 minutes to verify the exam score because staffs must use more time to check exam score correctly and accuracy. With the new system, the program is introduced to verify the exam score and attendant data through graphical user interface.

(4) Score evaluation: This process is also time-consuming task. The time is spent to search the subject, exam score and ID of student from the database, and check the calculation result before recording into MS Excel. But in the proposed system, program will provide the calculation function to facilitate this process. In addition, it can issue transcript and summary report automatically according to user requirement.

5.2 Recommendations

Although Registration and Evaluation System is quite successfully developed, there are still some modifications to keep the system working effectively and to fit the school's changing needs and support expansion especially education of student. The management should follow up with all user requirements and lead them to be familiar with the new proposed system. Furthermore, the system shall provide accurate on-time input too.

Management of information system is becoming more popular as the new way of organization management. The student registration and evaluation system is a small part of the school management system. The school should expand the system to cover all functions. The expansion depends on the priority of each function. The very important parts are finance and accounting, and they should be done first. Then, personnel system and other systems such as the library system should be developed. The connectivity of each system should be identified because all functions are related to each other.

Nowadays, The Internet is very important. The future version of the system will be able to connect to the Internet. The registration system will be performed through the Internet that this system will be bigger because students will be given the access codes and they will be treated as system users. So the system must provide high security such as using login, password or firewall in order to prevent unauthorized access because of the registration and grade information are secret and no one should be able to modify it. If the system is going to be available on the Internet, the users who are familiar with the Internet will know how to work on the Internet. So user training is also necessary for the future expansion. After the users are used to the computerized system, they should be given an opportunity to go to high level training courses.

APPENDIX   A

ENTITY RELATIONSHIP DIAGRAM
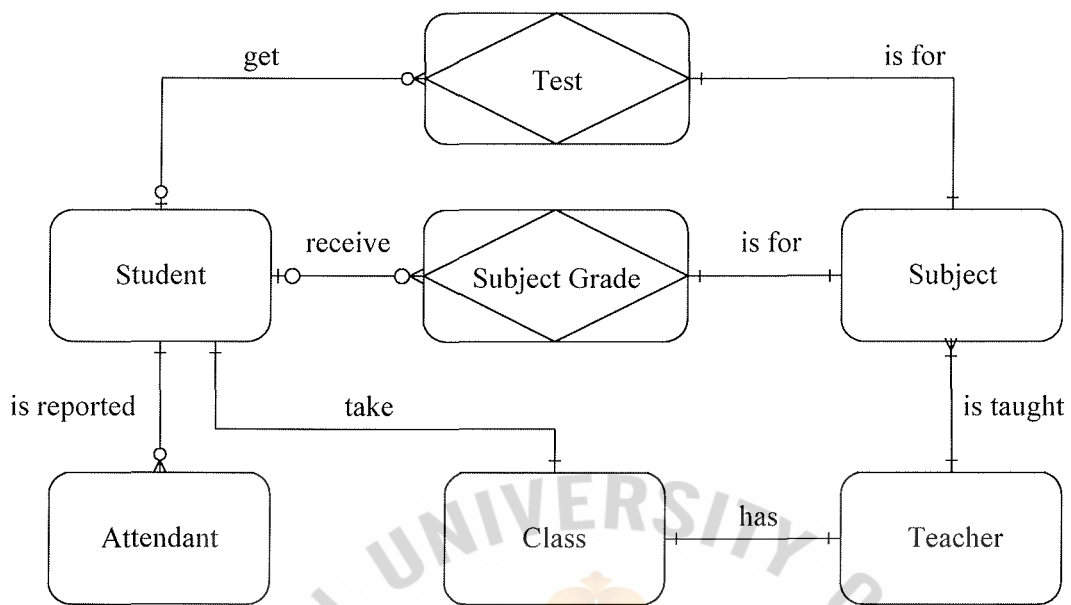
Figure A.1.   Context Entity Relationship Diagram.
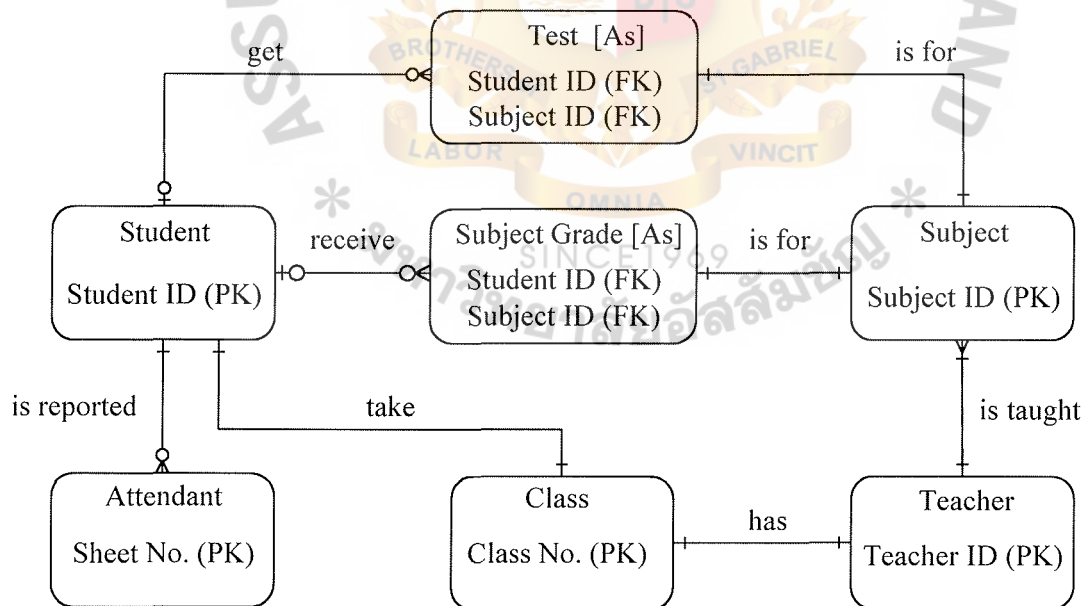
Figure A.2.   Key Based Entity Relationship Diagram.

54
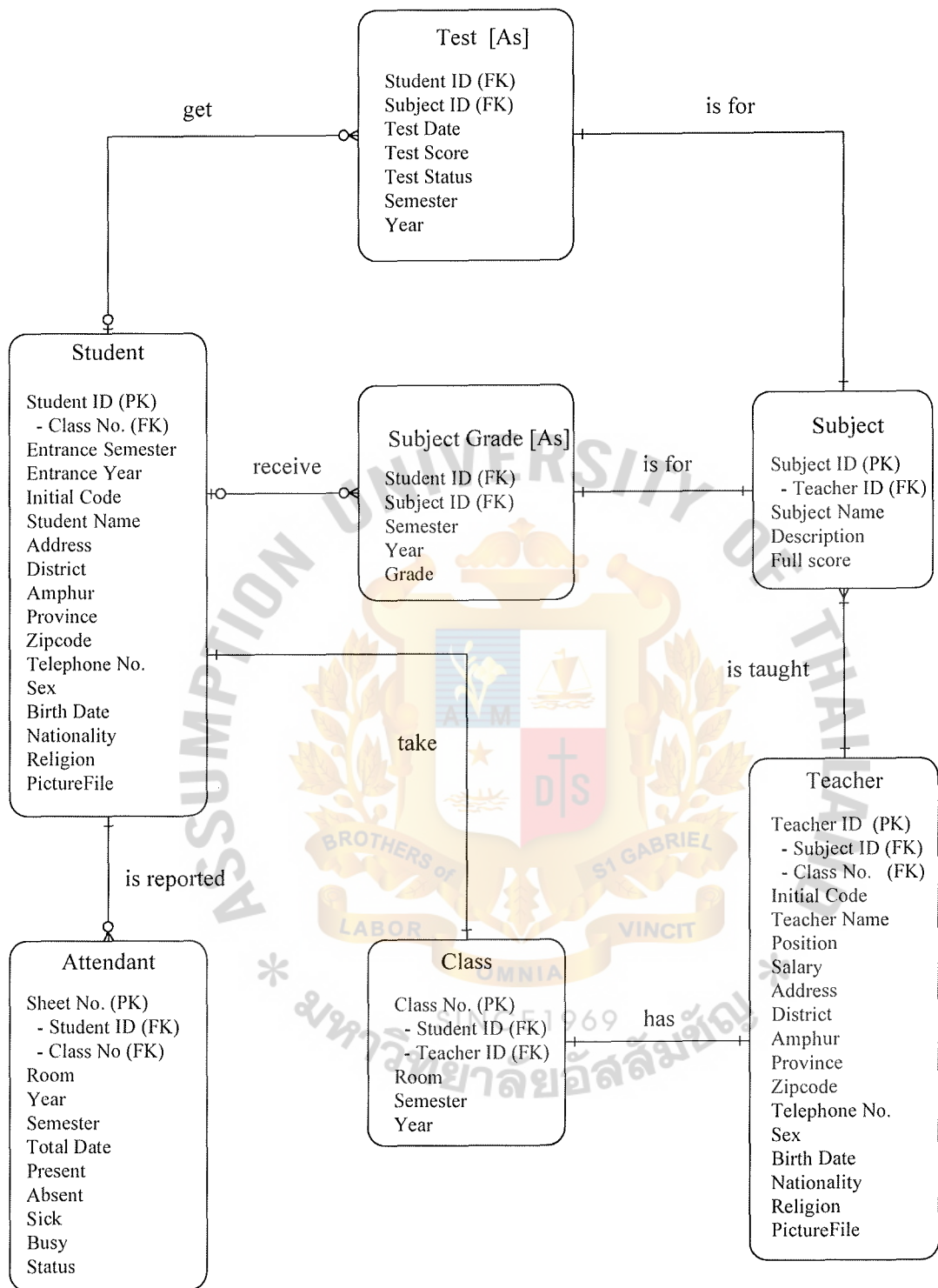
Figure A.3.   Fully Attribute Entity Relationship Diagram.

55

APPENDIX   B

DATA FLOW DIAGRAM

```
                    ┌─────────────────────┐
                    │          0          │
                    │ Student Registration│
                    │ and Evaluation System│
                    └─────────────────────┘
                               │
              ┌────────────────┴────────────────┐
    ┌─────────────────┐               ┌─────────────────┐
    │        1        │               │        2        │
    │   Registration  │               │    Evaluation   │
    │    Subsystem    │               │    Subsystem    │
    └─────────────────┘               └─────────────────┘
           │                                   │
     ┌─────┴─────┐                      ┌──────┴──────┐
```

1.1 New student admittance process	1.2 Student information maintenance process	2.1 Score verification process	2.2 Score evaluation process
1.1.1 Check student application	1.2.1 Retrieve changed student information	2.1.1 Retrieve attendant and score	2.2.1 Check attendant
1.1.2 Edit student application	1.2.2 Edit changed student information	2.1.2 Check exam score	2.2.2 Calculate grade
1.1.3 Prin pay-in-slip	1.2.3 Update student information	2.1.3 Edit exam score	2.2.3 Validate grade
1.1.4 New student record	1.2.4 Issue historical student report	2.1.4 Update verification score	2.2.4 Issue transcript
1.1.5 Issue ID			2.2.5 Generate summary evaluation report
1.1.6 Generate new student report			

Figure B.1.   Functional Decomposition Diagram.
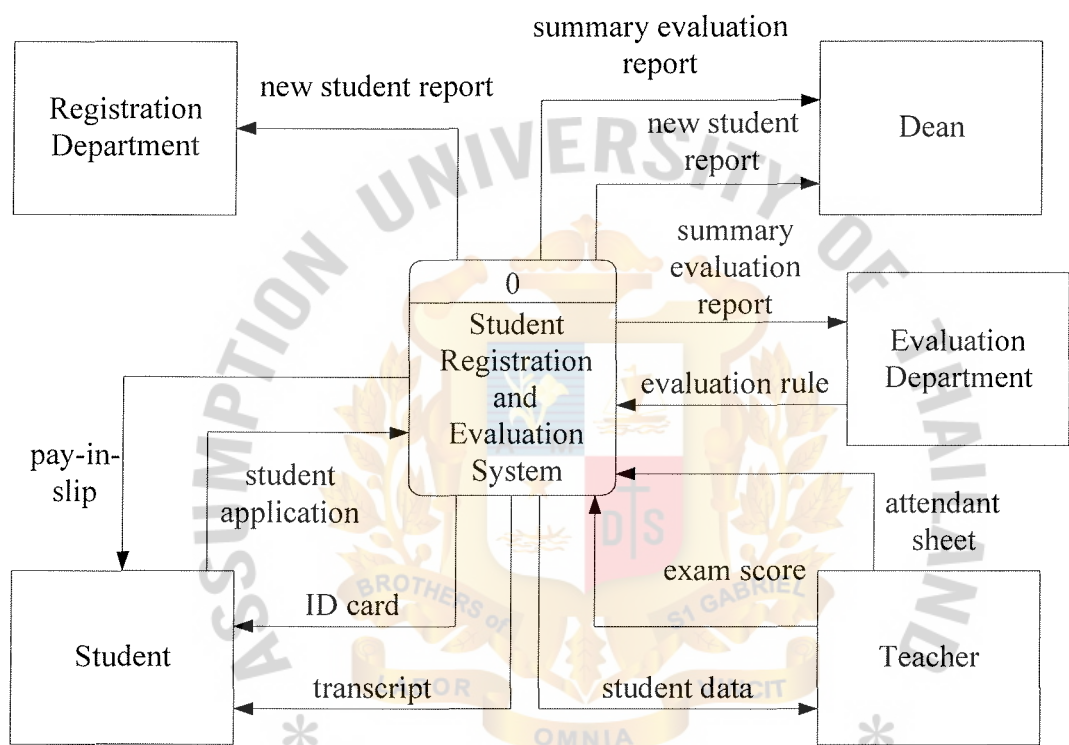
Figure B.2. Context Data Flow Diagram of Proposed System.
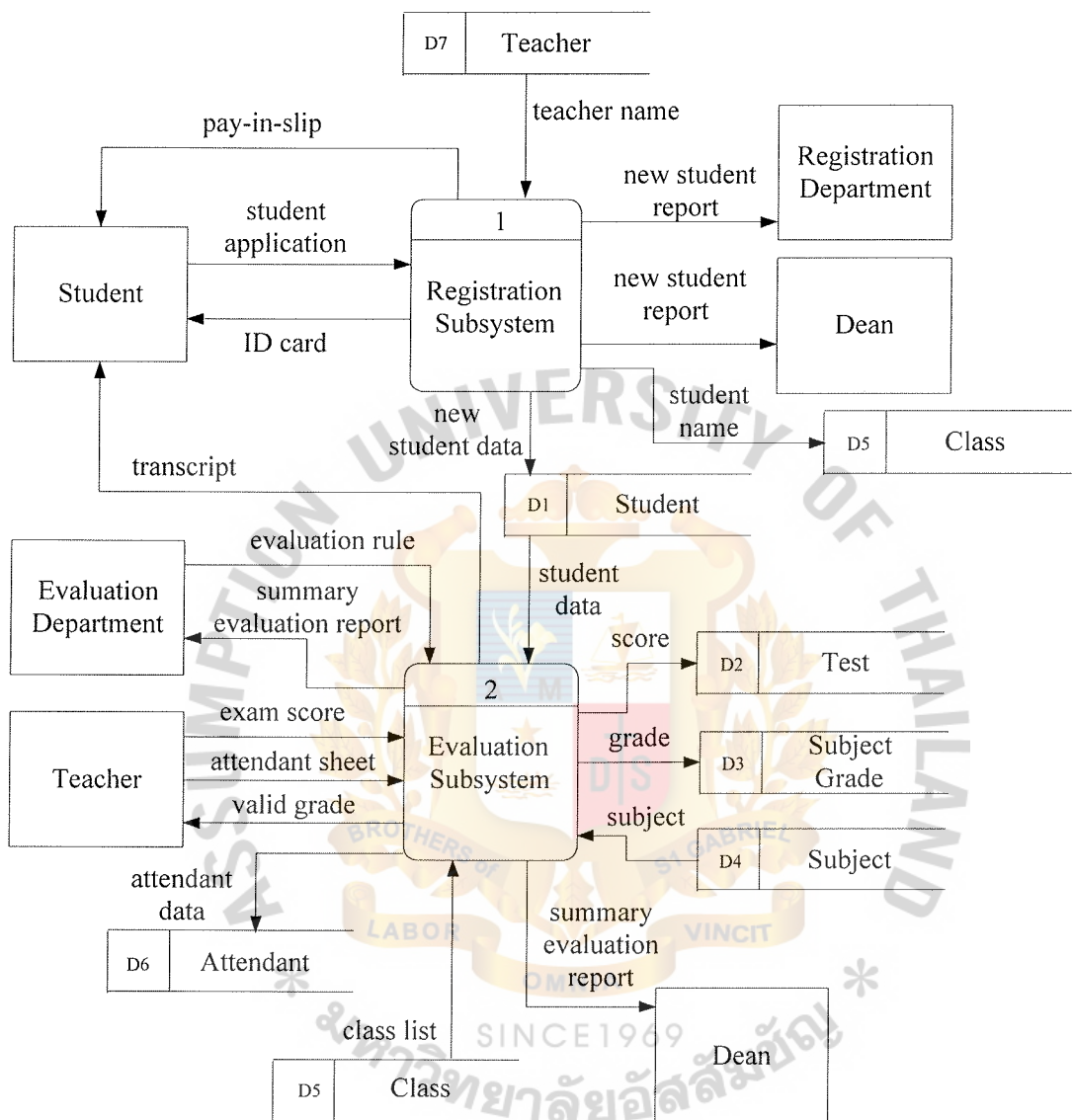
Figure B.3.   Data Flow Diagram – level 0.

58
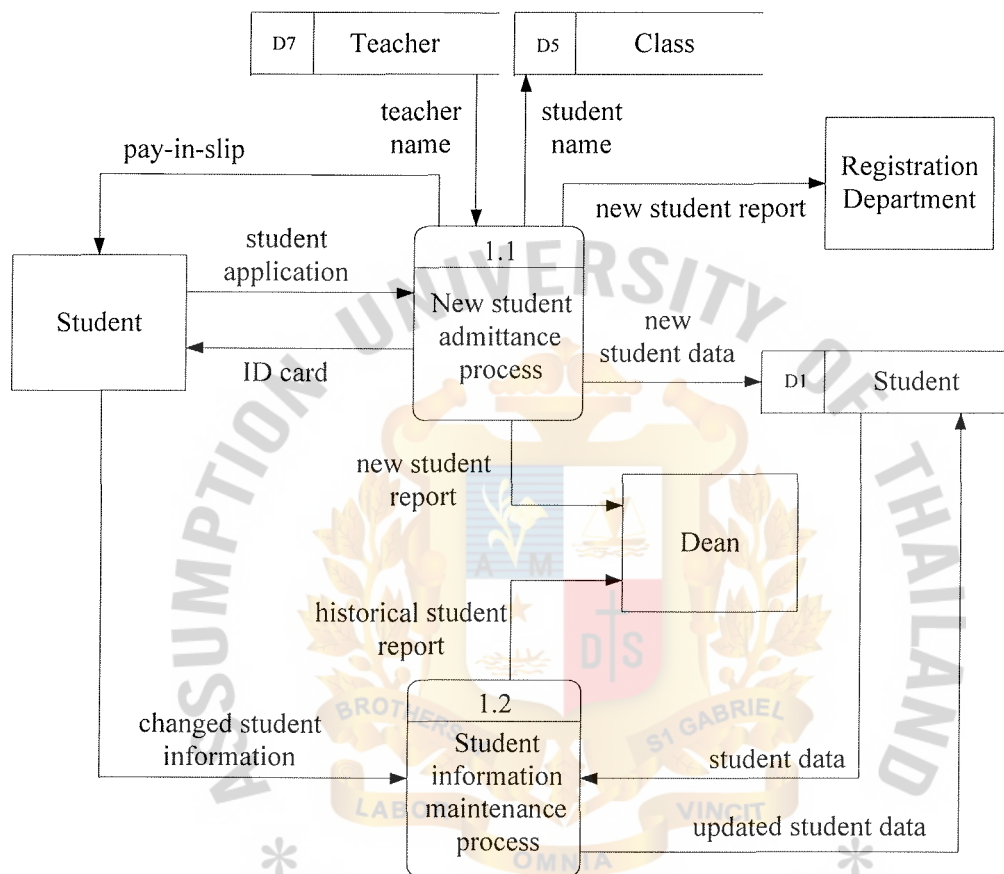
Figure B.4.   Data Flow Diagram – Registration Subsystem (level 1).

59
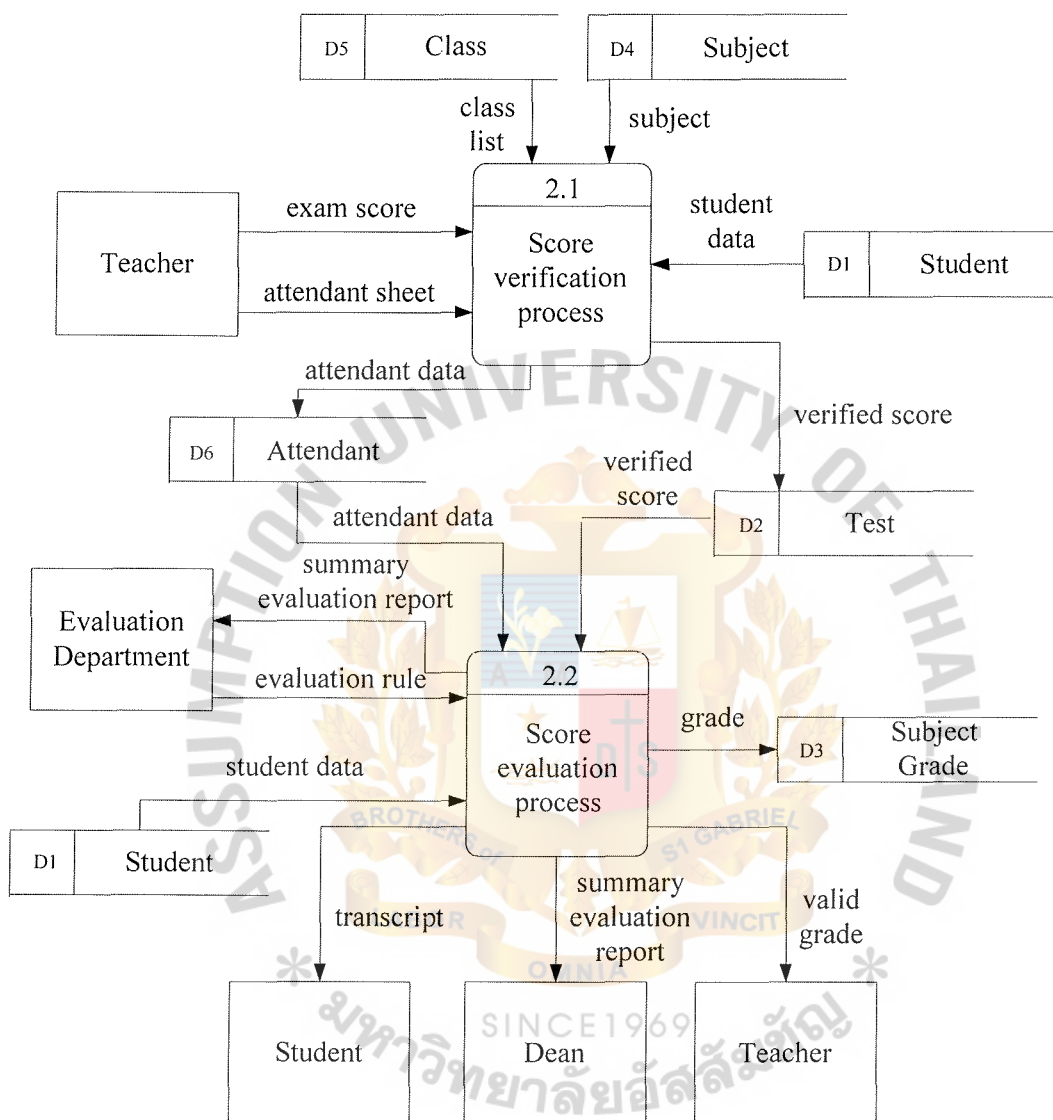
Figure B.5.   Data Flow Diagram – Evaluation Subsystem (level 1).

60
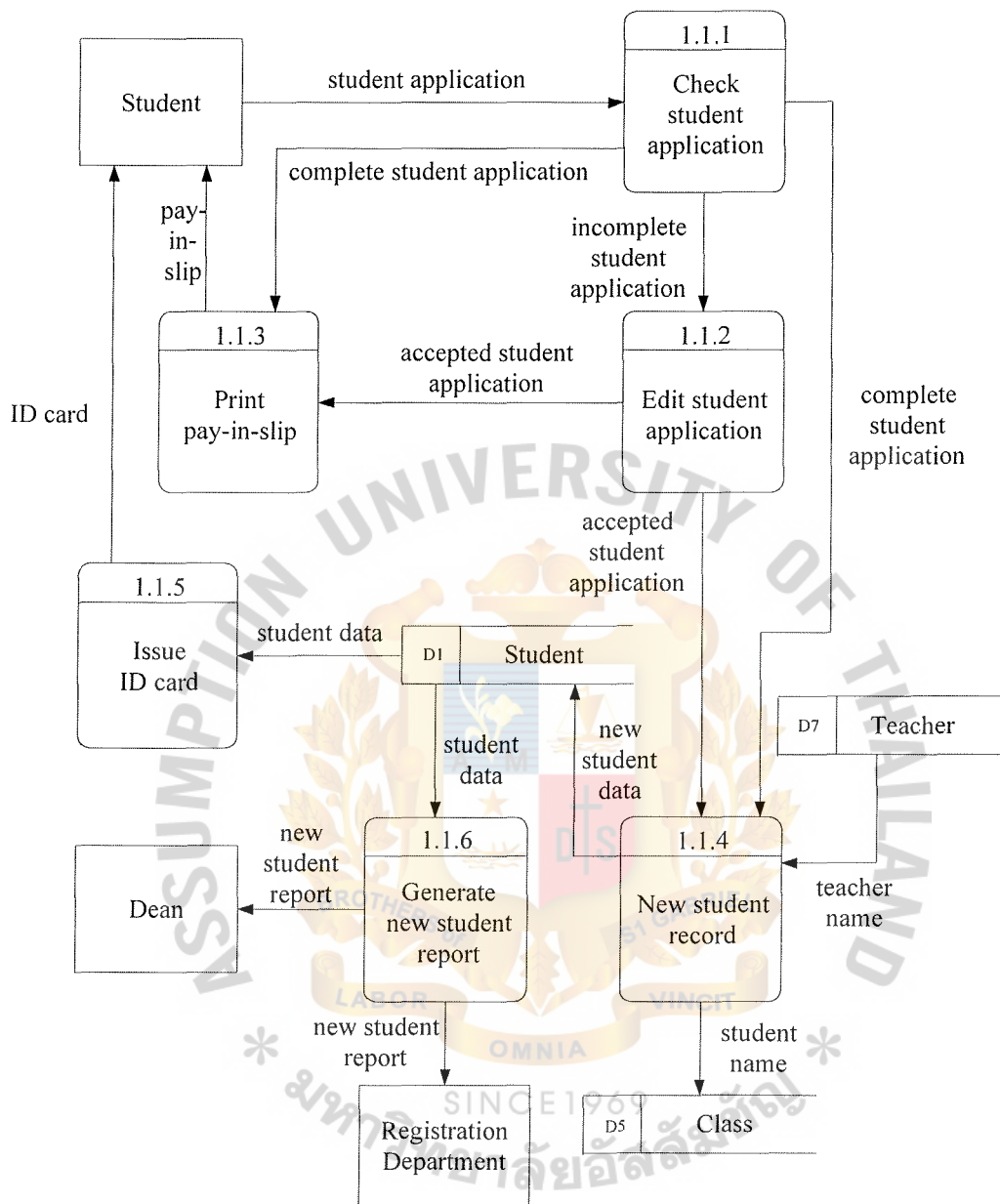
Figure B.6.   Data Flow Diagram – New student admittance process (level 2).

61
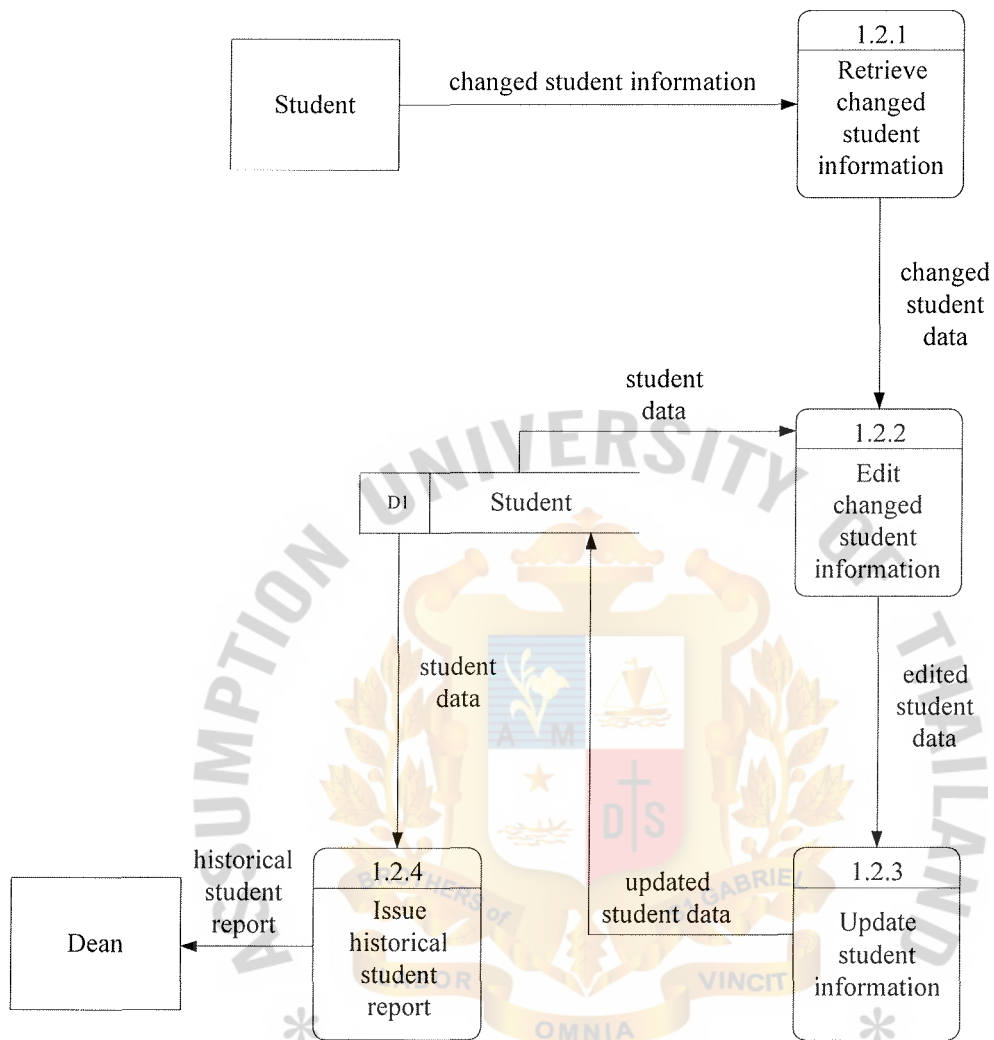
Figure B.7.   Data Flow Diagram – Student information maintenance process (level 2).

62
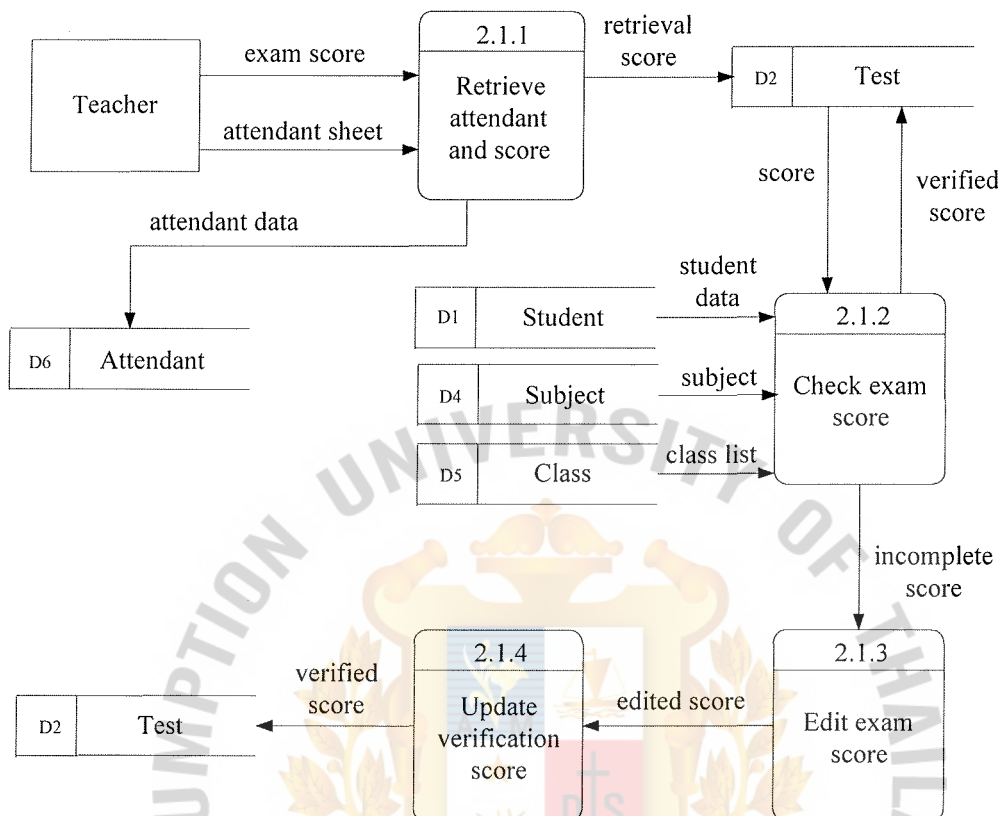
Figure B.8.   Data Flow Diagram – Score verification process (level 2).
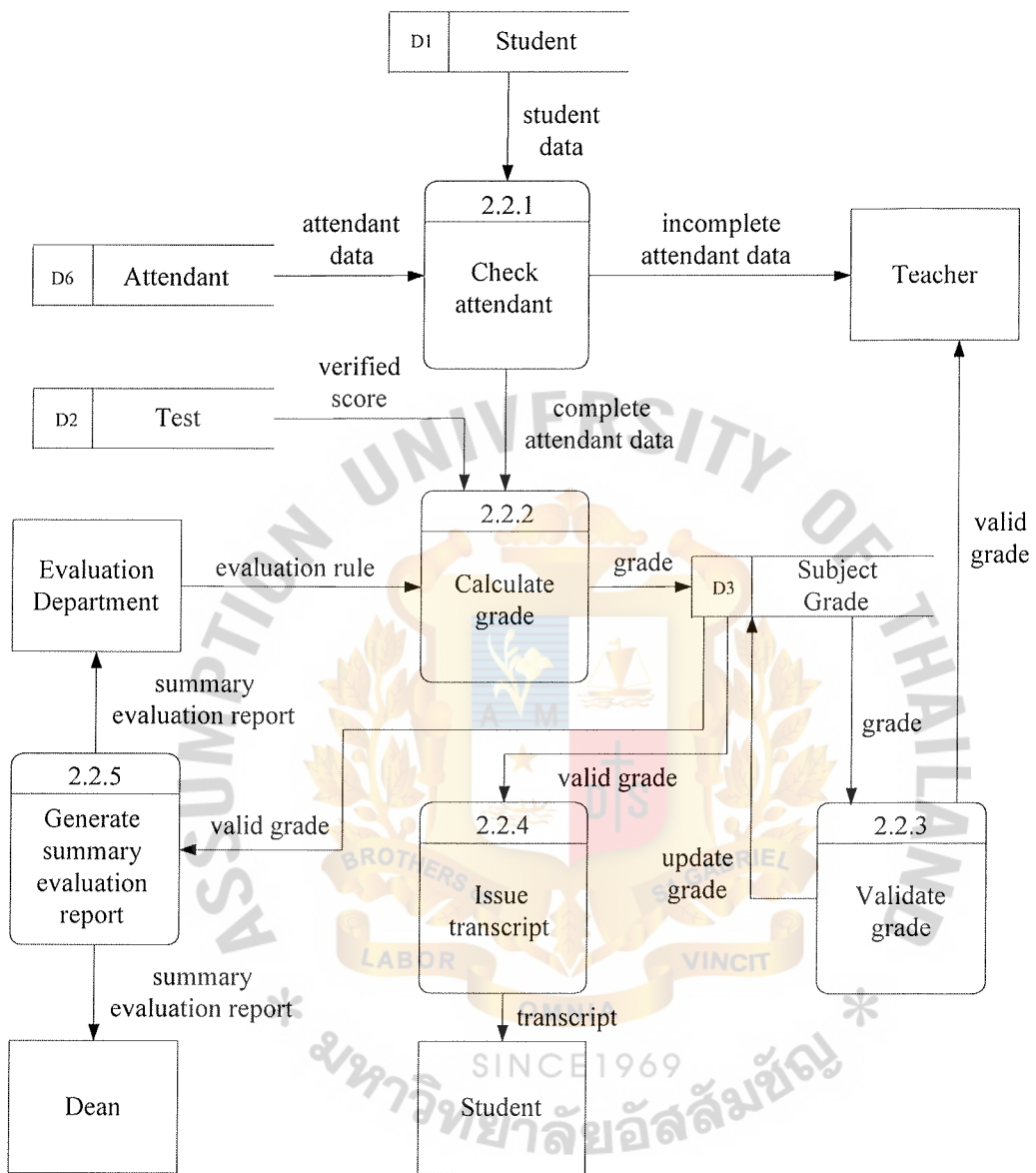
Figure B.9.   Data Flow Diagram – Score evaluation process (level 2).

64

APPENDIX   C

STRUCTURE DESIGN
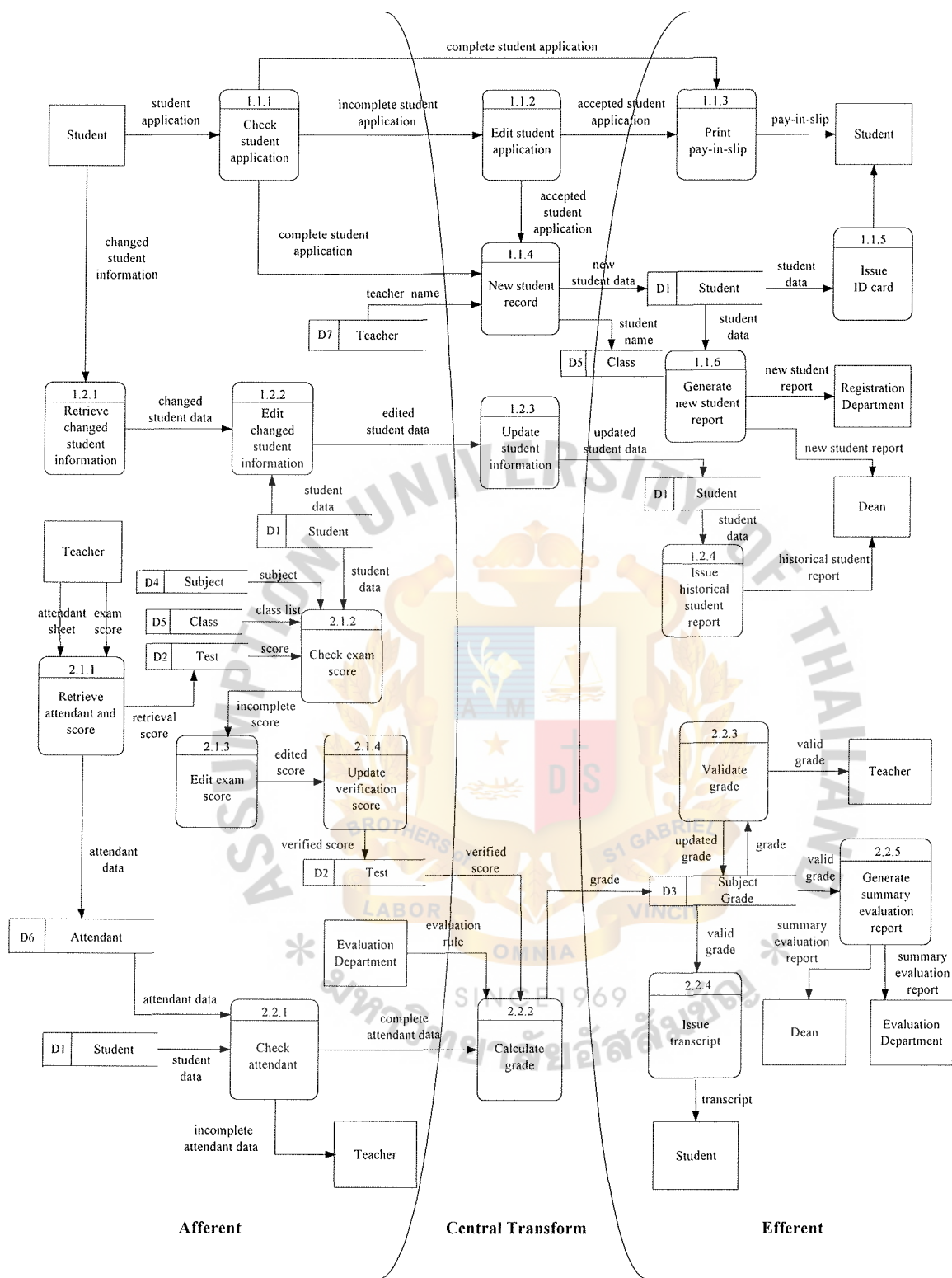
Figure C.1.   Partitioned Data Flow Diagram of Proposed System.

65
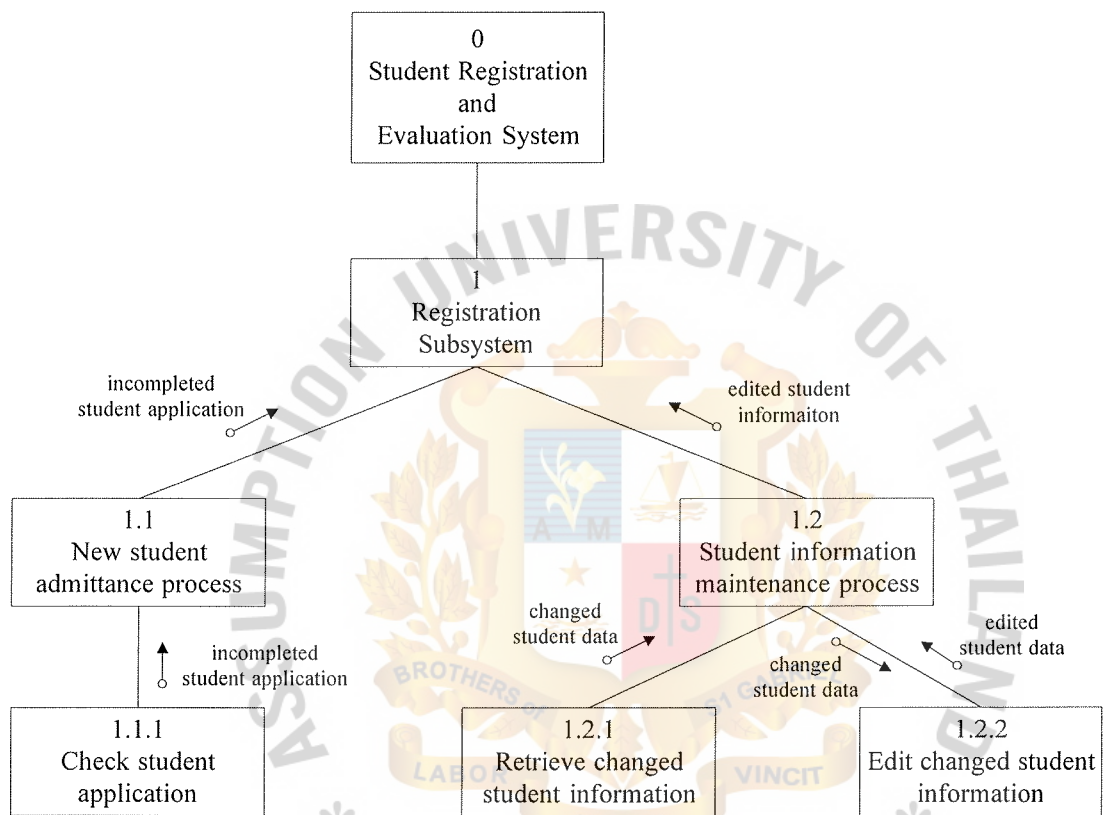
Figure C.2. Structure Chart of Afferent Process.
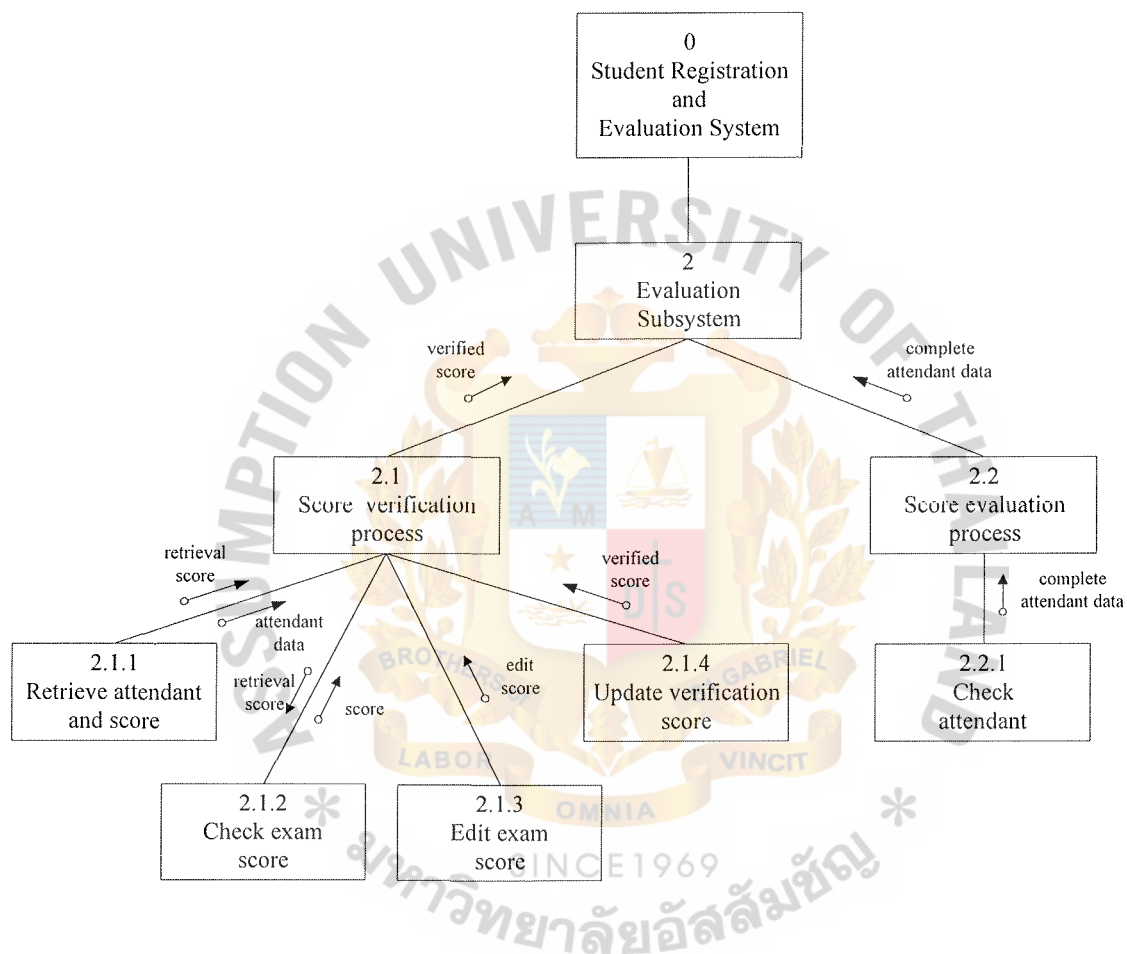
Figure C.3.   Structure Chart of Afferent Process (Continued).
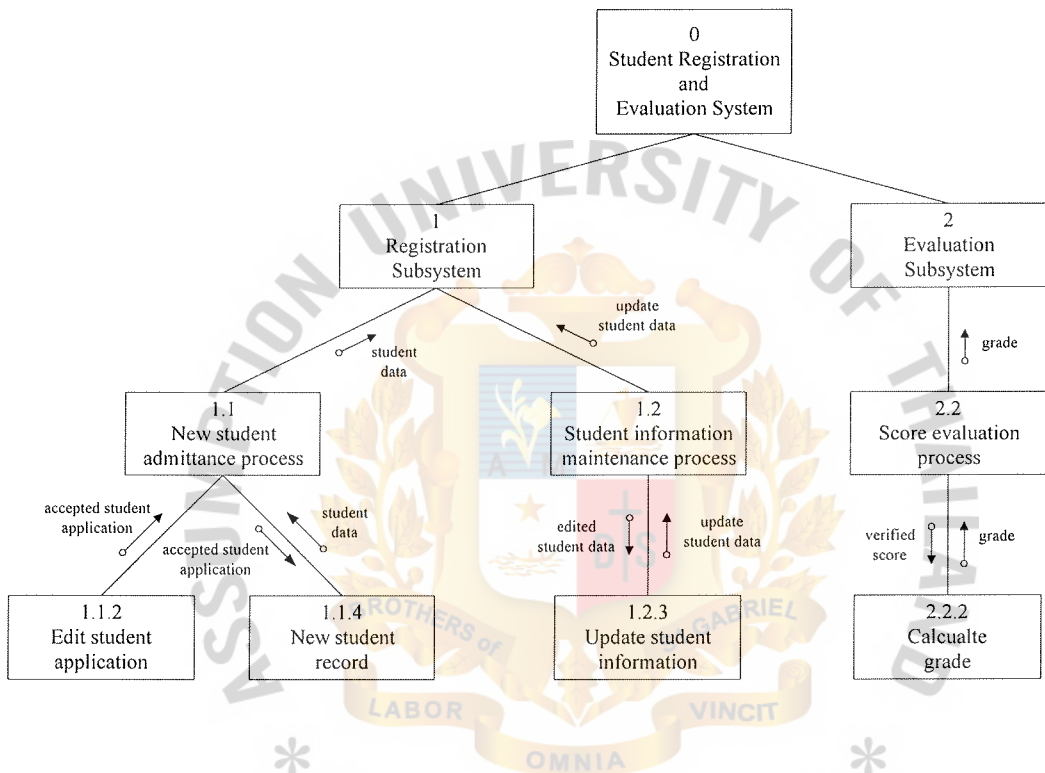
Figure C.4. Structure Chart of Central Transform Process.
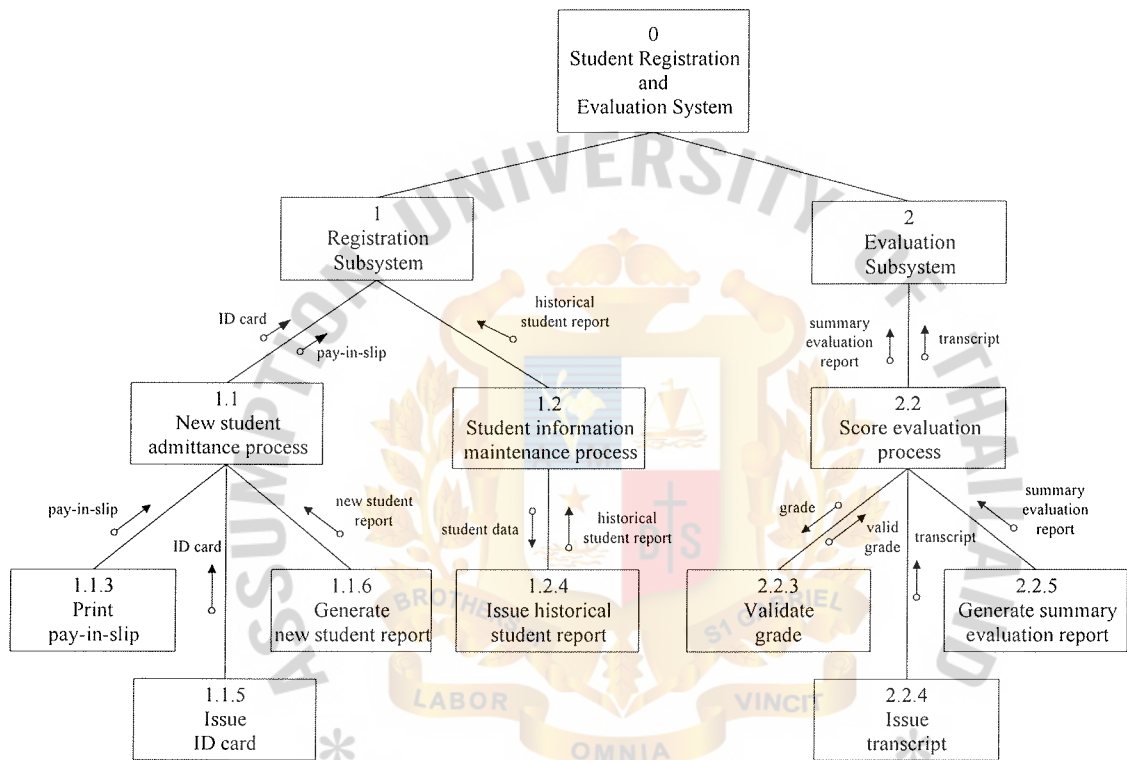
Figure C.5.   Structure Chart of Efferent Process.

APPENDIX   D

PROCESS SPECIFICATION

Table D.1. Process Specification of Process 1.1.

Items	Description
Process Name:	New Student Admittance Process
Data In:	Student Application Teacher Name
Data Out:	New Student Data Student Name Pay-in-slip ID card New Student Report
Process:	(1) Get Student application from Student (2) Retrieve Teacher Name from Teacher Database (3) Create New Student Data into Student Database (4) Send Student Name to Class Database (5) Issue Pay-in-slip to Student (6) Issue ID Card to Student (7) Generate New Student Report to Dean (8) Send New Student Report to Registration Department
Attachment:	(1) Student (2) Dean (3) Registration Department (4) Student Database (5) Teacher Database (6) Class Database

Table D.2. Process Specification of Process 1.1.1.

Items	Description
Process Name:	Check Student Application Process
Data In:	Student Application
Data Out:	(1) Complete Student Application (2) Incomplete Student Application
Process:	(1) Get Student Application from Student (2) Check Data in Student Application (3) Send Incomplete Student Application to Edit Student Application Process (4) Send Complete Student Application to New Student Record Process (5) Send Complete Student Application to Print Pay-in-slip Process
Attachment:	(1) Student (2) Edit Student Application Process (3) New Student Record Process (4) Print Pay-in-slip Process

70

Table D.3. Process Specification of Process 1.1.2.

Items	Description
Process Name:	Edit Student Application Process
Data In:	Incomplete Student Application
Data Out:	Complete Student Application
Process:	(1) Receive Incomplete Student Application from Check Student Application Process (2) Edit Data in Student Application (3) Send Complete Student Application to New Student Record Process (4) Send Complete Student Application to Print Pay-in-slip Process
Attachment:	(1) Check Student Application Process (2) New Student Record Process (3) Print Pay-in-slip Process

Table D.4. Process Specification of Process 1.1.3.

Items	Description
Process Name:	Print pay-in-slip Process
Data In:	Complete Student Application
Data Out:	Pay-in-slip
Process:	(1) Receive Complete Student Application from Edit Student Application Process (2) Issue Pay-in-slip to Student (3) Send Pay-in-slip to Student
Attachment:	(1) Edit Student Application Process (2) Student

71

Table D.5. Process Specification of Process 1.1.4.

Items	Description
Process Name:	New Student Record Process
Data In:	Complete Student Application Teacher Name
Data Out:	New Student Data Student Name
Process:	(1) Receive Complete Student Application from Check Student Application Process (2) Receive Complete Student Application from Edit Student Application Process (3) Receive Teacher Name from Teacher Database (4) Add New Student Data into Student Database (5) Send New Student Name to Class Database
Attachment:	(1) Edit Student Application Process (2) Student Database (3) Class Database (4) Teacher Database

Table D.6. Process Specification of Process 1.1.5.

Items	Description
Process Name:	Issue ID Card Process
Data In:	New Student Data
Data Out:	ID Card
Process:	(1) Receive New Student Data from Student Database (2) Issue ID Card to Student
Attachment:	(1) Student (2) Student Database

Table D.7. Process Specification of Process 1.1.6.

Items	Description
Process Name:	Generate Reports Process
Data In:	Student Data
Data Out:	New Student Report
Process:	(1) Receive Student Data from Student Database (2) Generate New Student Report to Dean (3) Send New Student Report to Registration Department
Attachment:	(1) Student Database (2) Dean (3) Registration Department

Table D.8. Process Specification of Process 1.2.

Items	Description
Process Name:	Student Information Maintenance Process
Data In:	Changed Student Information Student Data
Data Out:	Updated Student Data Historical Student Report
Process:	(1) Get Changed Student Information from Student (2) Retrieve Student Data from Student Database (3) Send Updated Student Data to Student Database (4) Send Historical Student Reports to Dean
Attachment:	(1) Student (2) Student Database (3) Dean

Table D.9. Process Specification of Process 1.2.1.

Items	Description
Process Name:	Retrieve Changed Student Information Process
Data In:	Changed Student Information
Data Out:	Changed Student Data
Process:	(1) Get Changed Student Information from Student (2) Send Changed Student Information to Edit Changed Student Information Process
Attachment:	(1) Student (2) Edit Changed Student Information Process

73

Table D.10. Process Specification of Process 1.2.2.

Items	Description
Process Name:	Edit Changed Student Information Process
Data In:	Changed Student Data
Data Out:	Edited Student Data
Process:	(1) Get Changed Student Data from Retrieve Changed Student Information Process (2) Receive Student Data from Student Database (3) Edit Student Data in Student Database (4) Send Edited Student Data to Update Student Data Process
Attachment:	(1) Retrieve Changed Student Information Process (2) Student Database (3) Update Student Data Process

Table D.11. Process Specification of Process 1.2.3.

Items	Description
Process Name:	Update Student Information Process
Data In:	Edited Student Data
Data Out:	Updated Student Data
Process:	(1) Receive Edited Student Data from Edit Changed Student Information Process (2) Update Student Data into Student Database
Attachment:	(1) Edit Changed Student Information Process (2) Student Database

Table D.12. Process Specification of Process 1.2.4.

Items	Description
Process Name:	Issue Historical Student Report Process
Data In:	Student Data
Data Out:	Historical Student Reports
Process:	(1) Receive Student Data from Student Database (2) Send Historical Student Reports to Dean
Attachment:	(1) Student Database (2) Dean

74

Table D.13.   Process Specification of Process 2.1.

Items	Description
Process Name:	Score Verification Process
Data In:	Student data Exam Score Attendant Sheet Subject Class list
Data Out:	Verified Score Attendant Data
Process:	(1) Receive Exam Score from Teacher (2) Receive Attendant Sheet from Teacher (3) Get Subject from Subject Database (4) Get Class list from Class Database (5) Send Exam Score to Test Database (6) Send Attendant Data to Attendant Database (7) Update Verified Score into Test Database
Attachment:	(1) Teacher (2) Test Database (3) Attendant Database (4) Student Database (5) Subject Database (6) Class Database

Table D.14.   Process Specification of Process 2.1.1.

Items	Description
Process Name:	Retrieve Attendant and Score Process
Data In:	Exam Score Attendant Sheet
Data Out:	Retrieval Score Attendant Data
Process:	(1) Receive Exam Score from Teacher (2) Receive Attendant Sheet from Teacher (3) Send Exam Score to Test Database (4) Send Attendant Data to Attendant Database
Attachment:	(1) Teacher (2) Test Database (3) Attendant Database

Table D.15.   Process Specification of Process 2.1.2.

Items	Description
Process Name:	Check Exam Score Process
Data In:	Score Student Data Subject Class list
Data Out:	Incomplete Score Verified Score
Process:	(1) Receive Score from Test Database (2) Receive Student Data from Student Database (3) Check Score in Test Database (4) Send Incomplete Score to Edit Exam Score Process (5) Send Verified Score to Test Database
Attachment:	(1) Test Database (2) Student Database (3) Subject Database (4) Class Database (5) Edit Exam Score Process

Table D.16.   Process Specification of Process 2.1.3.

Items	Description
Process Name:	Edit Exam Score Process
Data In:	Incomplete Score
Data Out:	Edited Score
Process:	(1) Receive Incomplete Score from Check Exam Score Process (2) Edit Score in Test Database (3) Send Edited Score to Update Verification Score Process
Attachment:	(1) Check Exam Score Process (2) Update Verification Score Process

Table D.17.   Process Specification of Process 2.1.4.

Items	Description
Process Name:	Update Verification Score Process
Data In:	Edited Score
Data Out:	Verified Score
Process:	(1) Receive Edited Score from Edit Exam Score Process (2) Update Edited Score into Test Database
Attachment:	(1) Edit Exam Score Process (2) Test Database

Table D.18.   Process Specification of Process 2.2.

Items	Description
Process Name:	Score Evaluation Process
Data In:	Evaluation Rule Student Data Attendant Data Verified Score
Data Out:	Valid Grade Transcript Summary Evaluation Report
Process:	(1) Receive Evaluation Rule from Evaluation Department (2) Receive Attendant Data from Attendant Database (3) Receive Verified Score from Test Database (4) Receive Student Data from Student Database (5) Check Attendant Data in Attendant Database (6) Calculate Grade of each student and each subject (7) Validate Grade in Subject Grade Database (8) Issue Transcript to Student (9) Generate Summary Evaluation Report to Dean and Evaluation Department
Attachment:	(1) Attendant Database (2) Test Database (3) Subject Grade Database (4) Student Database (5) Teacher (6) Student (7) Dean (8) Evaluation Department

Table D.19.　Process Specification of Process 2.2.1.

Items	Description
Process Name:	Check Attendant Process
Data In:	Attendant Data Student Data
Data Out:	Incomplete Attendant Data Complete Attendant Data
Process:	(1)　Receive Attendant Data from Attendant Database (2)　Receive Student Data from Student Database (3)　Check Attendant Data (4)　Send Incomplete Attendant Data to Teacher (5)　Send Complete Attendant Data to Calculate Grade Process
Attachment:	(1)　Attendant Database (2)　Student Database (3)　Teacher (4)　Calculate Grade Process

Table D.20.　Process Specification of Process 2.2.2.

Items	Description
Process Name:	Calculate Grade Process
Data In:	Complete Attendant Data Verified Score Evaluation Rule
Data Out:	Grade
Process:	(1)　Receive Evaluation Rule from Evaluation Department (2)　Receive Verified Score from Test Database (3)　Receive Complete Attendant Data from Check Attendant (4)　Calculate Grade (5)　Send Grade to Subject Grade Database
Attachment:	(1)　Evaluation Department (2)　Test Database (3)　Check Attendant Process (4)　Subject Grade Database

Table D.21. Process Specification of Process 2.2.3.

Items	Description
Process Name:	Validate Grade Process
Data In:	Grade
Data Out:	Update Grade
Process:	(1) Receive Grade from Subject Grade Database (2) Validate Grade (3) Update Grade into Subject Grade Database (4) Send Valid Grade to Teacher
Attachment:	(1) Subject Grade Database (2) Teacher

Table D.22. Process Specification of Process 2.2.4.

Items	Description
Process Name:	Issue Transcript
Data In:	Valid Grade
Data Out:	Transcript
Process:	(1) Receive Valid Grade from Subject Grade Database (2) Generate Transcript and Report (3) Send Transcript to Student
Attachment:	(1) Subject Grade Database (2) Student

Table D.23. Process Specification of Process 2.2.5.

Items	Description
Process Name:	Generate Summary Evaluation Report Process
Data In:	Valid Grade
Data Out:	Summary Evaluation Reports
Process:	(1) Receive Valid Grade from Subject Grade Database (2) Generate Summary Evaluation Report (3) Send Summary Evaluation Reports to Dean (4) Send Summary Evaluation Reports to Evaluation Department
Attachment:	(1) Subject Grade Database (2) Evaluation Department (3) Dean

`**APPENDIX   E**

DATABASE DESIGN

Table E.1. Structure of Student Table.

Name	Type	Length	Key Type	Foreign Key to Table	Check
Student ID	Text	5	Primary Key	Class Table	-
Entrance Semester	Number	1	Attribute	-	1 - 2
Entrance Year	Number	4	Attribute	-	4 Digits
Initial Code	Text	4	Attribute	-	-
Student Name	Text	30	Attribute	-	-
Address	Text	20	Attribute	-	-
District	Text	20	Attribute	-	-
Amphur	Text	20	Attribute	-	-
Province	Text	20	Attribute	-	-
Zipcode	Number	5	Attribute	-	5 Digits
Telephone No.	Number	9	Attribute	-	9 Digits
Sex	Text	1	Attribute	-	-
Birth Date	Date/Time		Attribute	-	-
Nationality	Text	10	Attribute	-	-
Religion	Text	10	Attribute	-	-
PictureFile	OLE object		Attribute	-	-

Table E.2. Structure of Subject Table.

Name	Type	Length	Key Type	Foreign Key to table	Check
Subject ID	Text	5	Primary Key	Student Table	-
Subject Name	Text	20	Attribute	-	-
Description	Text	30	Attribute	-	-
Full Score	Number	3	Attribute	-	0 - 100

Table E.3. Structure of Class Table.

Name	Type	Length	Key Type	Foreign Key to table	Check
Class No.	Text	1	Primary Key	Student Table	-
Room	Text	1	Attribute	-	-
Semester	Number	1	Attribute	-	1 - 2
Year	Number	4	Attribute	-	4 Digits

80

Table E.4. Structure of Subject Grade Table.

Name	Type	Length	Key Type	Foreign Key to table	Check
Student ID	Text	5	Primary Key	-	-
Subject ID	Text	5	Primary Key	-	-
Semester	Number	1	Attribute	-	1 - 2
Year	Number	4	Attribute	-	4 Digits
Grade	Number	1	Attribute	-	1 - 4

Table E.5. Structure of Test Table.

Name	Type	Length	Key Type	Foreign Key to table	Check
Student ID	Text	5	Primary Key	-	-
Subject ID	Text	5	Primary Key	-	-
Test Date	Date/Time		Attribute	-	-
Test Score	Number	3	Attribute	-	1 – 100
Test Status	Yes/No		Attribute	-	-
Semester	Number	1	Attribute	-	1 - 2
Year	Number	4	Attribute	-	4 Digits

Table E.6. Structure of Attendant Table.

Name	Type	Length	Key Type	Foreign Key to table	Check
Sheet No.	Number	3	Primary Key	Student Table	-
Student ID	Text	5	Primary Key	-	-
Class No.	Text	1	Attribute	-	-
Room	Text	1	Attribute	-	-
Year	Number	4	Attribute	-	4 digits
Semester	Number	1	Attribute	-	1 – 2
Total Date	Number	3	Attribute	-	-
Present	Number	3	Attribute	-	
Absent	Number	3	Attribute	-	-
Sick	Number	3	Attribute	-	-
Busy	Number	3	Attribute	-	-
Status	Yes/No	-	Attribute	-	-

81

Table E.7.   Structure of Teacher Table.

Name	Type	Length	Key Type	Foreign Key to Table	Check
Teacher ID	Text	5	Primary Key	Subject Table	-
Initial Code	Text	4	Attribute	-	-
Teacher Name	Text	30	Attribute	-	-
Position	Text	30	Attribute	-	-
Salary	Number	5	Attribute	-	-
Address	Text	20	Attribute	-	-
District	Text	20	Attribute	-	-
Amphur	Text	20	Attribute	-	-
Province	Text	20	Attribute	-	-
Zipcode	Number	5	Attribute	-	5 Digits
Telephone No.	Number	9	Attribute	-	9 Digits
Sex	Text	1	Attribute	-	-
Birth Date	Date/Time		Attribute	-	-
Nationality	Text	10	Attribute	-	-
Religion	Text	10	Attribute	-	-
PictureFile	OLE object		Attribute	-	-

82

APPENDIX   F

DATA DICTIONARY

Table F.1.　Data Dictionary of Student Registration and Evaluation Database.

Field Name	Meaning
Absent	Amount date of student who absent
Address	Address
Amphur	Amphur name
Birth Date	Date of birth
Busy	Amount date of student who busy
Class No.	Class number
Description	Description of each subject
District	District name
Entrance Semester	Semester of enter
Entrance Year	Year of enter
Full Score	Full score of each subject
Grade	Grade of each subject that students receive after end of semester
Initial Code	Status of student and teacher that could be Mr. or Ms.
Nationality	Condition of belonging to a particular nation by birth
PictureFile	Picture file of student and teacher
Position	Current position of teacher
Present	Amount date of student who present
Province	Province name
Religion	Religion
Room	Room number
Salary	Teacher's salary
Semester	Semester of education
Sex	Male or Female
Sheet No.	Sheet number of attendant sheet
Sick	Amount date of student who sick
Status	Pass or Fail
Student ID	Student's identification number
Student Name	Student's name
Teacher ID	Teacher's identification number
Teacher Name	Teacher's name
Telephone No.	Telephone number
Test Date	Date of test in each subject
Test Score	Score of each subject after test
Test Status	Pass or Fail of test in each subject
Total Date	Amount date of studying
Year	Year of education
Zipcode	Zipcode

Table F.2. Data Dictionary of Student Registration and Evaluation Data Flow Diagram.

Name	Type	Description
Accepted student application	Data Flow	The completeness of student application after editing the information of student
Attendant data	Data Flow	Read attendant data of student from attendant sheet
Attendant sheet	Data Flow	Attendant sheet is sent from teacher
Changed student data	Data Flow	Read the data of student which is changed
Changed student information	Data Flow	Information of student is changed by student
Class list	Data Flow	Read class list from class database
Complete attendant data	Data Flow	The completeness of attendant data after checking the correctness of data
Complete student application	Data Flow	The completeness of student application after checking the correctness of information
Edited score	Data Flow	Score is edited before updating into test database
Edited student data	Data Flow	Data of student is edited before updating into student database
Evaluation rule	Data Flow	The rules of evaluation in examination that student will pass or not
Exam score	Data Flow	Score is sent from teacher
Grade	Data Flow	Results from calculate grade before adding into subject grade database
Historical student report	Data Flow	Results from issue historical information of student in each semester and year
ID card	Data Flow	Issue identification number card of student to student
Incomplete attendant data	Data Flow	The incompleteness of attendant data after checking the correctness of information
Incomplete score	Data Flow	The incompleteness of score after checking the correctness of score
Incomplete student application	Data Flow	The incompleteness of student application after checking the correctness of information
New student data	Data Flow	Data of new student before adding into student database
New student report	Data Flow	Results from generate information of new students in each semester and year
Pay-in-slip	Data Flow	Pay-in-slip is distribute to student
Retrieval score	Data Flow	Score is received from teacher
Score	Data Flow	Read score from test database

84

Table F.2.   Data Dictionary of Student Registration and Evaluation Data Flow Diagram (Continued).

Name	Type	Description
Student application	Data Flow	The application of student that student send to school before checking the correctness of information
Student data	Data Flow	Read student data from student database
Student Name	Data Flow	Send student name to class database in order to set up class list
Subject	Data Flow	Read subject from subject database
Summary evaluation report	Data Flow	Results from generate summary evaluation of student in each semester and year
Teacher Name	Data Flow	Read teacher name from teacher database
Transcript	Data Flow	Result from generate
Update grade	Data Flow	Grade is updated into subject grade database
Update student data	Data Flow	Data of student is updated after editing data
Valid grade	Data Flow	Results of validate grade
Verified score	Data Flow	Results of verified score
Attendant	Data Store	Store information of attendant data for each student and each class
Class	Data Store	Store information of class and room
Student	Data Store	Store information of student for each student
Subject	Data Store	Store information of subject
Subject Grade	Data Store	Store grade of student for each subject and each semester
Teacher	Data Store	Store information of teacher
Test	Data Store	Store score of student after testing for each subject and each semester
Dean	External Entity	Executive person who is responsible about administration and making decision
Evaluation Department	External Entity	Department that is responsible for evaluation and calculation grade of student
Registration Department	External Entity	Department that is responsible for admittance student and maintaining information of student
Student	External Entity	Person who is responsible for studying and testing
Teacher	External Entity	Person who is responsible for teaching
Calculate grade	Process	Calculation grade of student in each subject
Check attendant	Process	Checking attendant data of student after retrieving from teacher

85

Table F.2. Data Dictionary of Student Registration and Evaluation Data Flow Diagram (Continued).

Name	Type	Description
Check exam score	Process	Checking exam score of testing after retrieving from teacher
Check student application	Process	Checking the student application before adding student data into student database
Edit changed student information	Process	Editing the information of student after student changed information
Edit exam score	Process	Editing exam score after checking score from test database
Edit student application	Process	Editing the student application after checking incomplete of application
Generate new student report	Process	Making report about new student in each semester and year for dean and registration department
Generate summary evaluation report	Process	Making summary report about studied results of student in each class and semester for dean and evaluation department
Generate transcript	Process	Making report about studied results of student in each class and semester for student
Issue historical student report	Process	Making report about historical of student in each class and semester for dean
Issue ID card	Process	Making Identification number card of student for student
New student record	Process	Recording new student data
Print pay-in-slip	Process	Making pay-in-slip for student
Retrieve attendant and score	Process	Read attendant data and exam score of student from teacher
Retrieve changed student information	Process	Read information of student which is changed by student
Update student information	Process	Updating information of student after editing information
Update verification score	Process	Updating score after verified score
Validate grade	Process	Validation grade before adding valid grade into subject grade database

APPENDIX   G

FEASIBILITY ANALYSIS

Table G.1. Estimate Cost of Existing System, Baht.

Cost Items		Year 1	Year 2	Year 3	Year 4	Year 5
Fixed Cost						
Workstation Maintenance Cost		37,500	41,250	45,375	49,913	54,904
5 Sets @ 7,500 Baht/Year						
Software Maintenance Cost		22,500	24,750	27,225	29,948	32,942
5 Sets @ 4,500 Baht/Year						
Total Fixed Cost		60,000	66,000	72,600	79,860	87,846
Operating Cost						
1. Personnel Cost:						
Manager	2 Person @ 15,000 / Month	30,000	31,500	33,075	34,729	36,465
Officer	6 Person @ 10,000 / Month	60,000	63,000	66,150	69,458	72,930
Staff	5 Person @ 9,500 / Month	47,500	49,875	52,369	54,987	57,737
Total monthly Personnel Cost		137,500	144,375	151,594	159,173	167,132
Total Annual Personnel Cost		1,650,000	1,732,500	1,819,125	1,910,081	2,005,585
2. Office Supplies & Miscellaneous Cost:						
Stationary	47,000 Baht / Year	47,000	51,700	56,870	62,557	68,813
Office Supplies	56,000 Baht / Year	56,000	61,600	67,760	74,536	81,990
Computer Supplies	64,000 Baht / Year	64,000	70,400	77,440	85,184	93,702
Utilities	57,000 Baht / Year,	57,000	62,700	68,970	75,867	83,454
Miscellaneous	36,000 Baht / Year	36,000	39,600	43,560	47,916	52,708
Total Annual Office Supplies & Miscellaneous Cost		260,000	286,000	314,600	346,060	380,666
Total Annual Operating Cost		1,910,000	2,018,500	2,133,725	2,256,141	2,386,251
Total Manual System Cost		1,970,000	2,084,500	2,206,325	2,336,001	2,474,097

Table G.2. The Cost of the Candidate 1, Baht.

Cost Items		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
1. Hardware Cost						
Server	1 Set @ 125,000 Baht	25,000	25,000	25,000	25,000	25,000
Client	5 Set @ 200,000 Baht	40,000	40,000	40,000	40,000	40,000
UPS	1 Unit @ 10,000 Baht	2,000	2,000	2,000	2,000	2,000
Total Hardware Cost		67,000	67,000	67,000	67,000	67,000
2. Software Cost						
Server Software	2 License @ 30,500 Baht	6,100	6,100	6,100	6,100	6,100
Client Software	1 License @ 5,000 Baht	1,000	1,000	1,000	1,000	1,000
Total Software Cost		7,100	7,100	7,100	7,100	7,100
3. Peopleware Cost						
System Analyst	1 Person @ 5 Month @ 30,000 Baht	150,000	0	0	0	0
Programmer	3 Person @ 3 Month @ 20,000 Baht	180,000	0	0	0	0
Database Specialist	1 Person @ 3 Month @ 25,000 Baht	75,000	0	0	0	0
Network Specialist	1 Person @ 1 Month @ 25,000 Baht	25,000	0	0	0	0
Total Peopleware Cost		430,000	0	0	0	0
4. Implementation Cost						
Training Cost		65,000	0	0	0	0
Installation Cost		10,000	0	0	0	0
Total Implementation Cost		75,000	0	0	0	0
Total System Development Cost		579,100	74,100	74,100	74,100	74,100
Operating Cost						
1. Maintenance Cost						
Server Maintenance Cost	1 Set @ 30,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Workstation Maintenance Cost	5 Set @ 6,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Software Maintenance Cost	5 Set @ 1,000 Baht / Year	5,000	5,500	6,050	6,655	7,321
Total Maintenance Cost		65,000	71,500	78,650	86,515	95,167
2. Personnel Cost:						
User:						
Manager	2 Person @ 15,000 Baht / Month	30,000	31,500	33,075	34,729	36,465
Officer	5 Person @ 10,000 Baht / Month	50,000	52,500	55,125	57,881	60,775
Staff	2 Person @ 9,500 Baht / Month	19,000	19,950	20,948	21,995	23,095
System Administration:						
Database Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Network Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Total monthly Personnel Cost		124,000	130,200	136,710	143,546	150,723
Total Annual Personnel Cost		1,488,000	1,562,400	1,640,520	1,722,546	1,808,673
3. Office Supplies & Miscellaneous Cost:						
Stationary	22,000 Baht / Year	22,000	24,200	26,620	29,282	32,210
Office Supplies	30,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Computer Supplies	34,000 Baht / Year	34,000	37,400	41,140	45,254	49,779
Utilities	41,000 Baht / Year	41,000	45,100	49,610	54,571	60,028
Miscellaneous	19,000 Baht / Year	19,000	20,900	22,990	25,289	27,818
Total Annual Office Supplies & Miscellaneous Cost		146,000	160,600	176,660	194,326	213,759
Total Operating Cost		1,699,000	1,794,500	1,895,830	2,003,387	2,117,598
Total Computerized System Cost		2,278,100	1,868,600	1,969,930	2,077,487	2,191,698

Table G.3. The Cost of the Candidate 2, Baht.

Cost Items		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
1. Hardware Cost						
Server	1 Set @ 125,000 Baht	25,000	25,000	25,000	25,000	25,000
Client	5 Set @ 200,000 Baht	40,000	40,000	40,000	40,000	40,000
UPS	1 Unit @ 10,000 Baht	2,000	2,000	2,000	2,000	2,000
Total Hardware Cost		67,000	67,000	67,000	67,000	67,000
2. Software Cost						
Server Software	2 License @ 82,000 Baht	16,400	16,400	16,400	16,400	16,400
Client Software	1 License @ 10,000 Baht	2,000	2,000	2,000	2,000	2,000
Total Software Cost		18,400	18,400	18,400	18,400	18,400
3. Peopleware Cost						
System Analyst	1 Person @ 6 Month @ 30,000 Baht	210,000	0	0	0	0
Programmer	3 Person @ 3 Month @ 20,000 Baht	180,000	0	0	0	0
Database Specialist	1 Person @ 2 Month @ 25,000 Baht	50,000	0	0	0	0
Network Specialist	1 Person @ 1 Month @ 25,000 Baht	25,000	0	0	0	0
Total Peopleware Cost		465,000	0	0	0	0
4. Implementation Cost						
Training Cost		90,000	0	0	0	0
Installation Cost		18,000	0	0	0	0
Total Implementation Cost		108,000	0	0	0	0
Total System Development Cost		658,400	85,400	85,400	85,400	85,400
Operating Cost						
1. Maintenance Cost						
Server Maintenance Cost	1 Set @ 50,000 Baht / Year	50,000	55,000	60,500	66,550	73,205
Workstation Maintenance Cost	5 Set @ 7,500 Baht / Year	37,500	41,250	45,375	49,913	54,904
Software Maintenance Cost	5 Set @ 2,000 Baht / Year	10,000	11,000	12,100	13,310	14,641
Total Maintenance Cost		97,500	107,250	117,975	129,773	142,750
2. Personnel Cost:						
User:						
Manager	2 Person @ 15,000 Baht / Month	30,000	31,500	33,075	34,729	36,465
Officer	5 Person @ 10,000 Baht / Month	50,000	52,500	55,125	57,881	60,775
Staff	2 Person @ 9,500 Baht / Month	19,000	19,950	20,948	21,995	23,095
System Administration:						
Database Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Network Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Total monthly Personnel Cost		124,000	130,200	136,710	143,546	150,723
Total Annual Personnel Cost		1,488,000	1,562,400	1,640,520	1,722,546	1,808,673
3. Office Supplies & Miscellaneous Cost:						
Stationary	22,000 Baht / Year	22,000	24,200	26,620	29,282	32,210
Office Supplies	30,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Computer Supplies	34,000 Baht / Year	34,000	37,400	41,140	45,254	49,779
Utilities	41,000 Baht / Year	41,000	45,100	49,610	54,571	60,028
Miscellaneous	19,000 Baht / Year	19,000	20,900	22,990	25,289	27,818
Total Annual Office Supplies & Miscellaneous Cost		146,000	160,600	176,660	194,326	213,759
Total Operating Cost		1,731,500	1,830,250	1,935,155	2,046,645	2,165,182
Total Computerized System Cost		2,389,900	1,915,650	2,020,555	2,132,045	2,250,582

Table G.4. The Cost of the Candidate 3, Baht.

Cost Items		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
1. Hardware Cost						
Server	1 Set @ 125,000 Baht	25,000	25,000	25,000	25,000	25,000
Client	5 Set @ 200,000 Baht	40,000	40,000	40,000	40,000	40,000
UPS	1 Unit @ 10,000 Baht	2,000	2,000	2,000	2,000	2,000
Total Hardware Cost		67,000	67,000	67,000	67,000	67,000
2. Software Cost						
Server Software	3 License @ 30,500 Baht	6,100	6,100	6,100	6,100	6,100
Client Software	1 License @ 5,000 Baht	1,000	1,000	1,000	1,000	1,000
Total Software Cost		7,100	7,100	7,100	7,100	7,100
3. Peopleware Cost						
System Analyst	1 Person @ 4 Month @ 30,000 Baht	120,000	0	0	0	0
Programmer	2 Person @ 3 Month @ 20,000 Baht	120,000	0	0	0	0
Database Specialist	1 Person @ 2 Month @ 25,000 Baht	50,000	0	0	0	0
Network Specialist	1 Person @ 1 Month @ 25,000 Baht	25,000	0	0	0	0
Total Peopleware Cost		315,000	0	0	0	0
4. Implementation Cost						
Training Cost		50,000	0	0	0	0
Installation Cost		9,500	0	0	0	0
Total Implementation Cost		59,500	0	0	0	0
Total System Development Cost		448,600	74,100	74,100	74,100	74,100
Operating Cost						
1. Maintenance Cost						
Server Maintenance Cost	1 Set @ 35,000 Baht / Year	35,000	38,500	42,350	46,585	51,244
Workstation Maintenance Cost	5 Set @ 3,500 Baht / Year	17,500	19,250	21,175	23,293	25,622
Software Maintenance Cost	5 Set @ 700 Baht / Year	3,500	3,850	4,235	4,659	5,124
Total Maintenance Cost		56,000	61,600	67,760	74,536	81,990
2. Personnel Cost:						
User:						
Manager	2 Person @ 15,000 Baht / Month	30,000	31,500	33,075	34,729	36,465
Officer	5 Person @ 10,000 Baht / Month	50,000	52,500	55,125	57,881	60,775
Staff	2 Person @ 9,500 Baht / Month	19,000	19,950	20,948	21,995	23,095
System Administration:						
Database Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Network Administrator	1 Person @ 25,000 / Month	12,500	13,125	13,781	14,470	15,194
Total monthly Personnel Cost		124,000	130,200	136,710	143,546	150,723
Total Annual Personnel Cost		1,488,000	1,562,400	1,640,520	1,722,546	1,808,673
3. Office Supplies & Miscellaneous Cost:						
Stationary	22,000 Baht / Year	22,000	24,200	26,620	29,282	32,210
Office Supplies	30,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Computer Supplies	34,000 Baht / Year	34,000	37,400	41,140	45,254	49,779
Utilities	41,000 Baht / Year	41,000	45,100	49,610	54,571	60,028
Miscellaneous	19,000 Baht / Year	19,000	20,900	22,990	25,289	27,818
Total Annual Office Supplies & Miscellaneous Cost		146,000	160,600	176,660	194,326	213,759
Total Operating Cost		1,690,000	1,784,600	1,884,940	1,991,408	2,104,422
Total Computerized System Cost		2,138,600	1,858,700	1,959,040	2,065,508	2,178,522

Table G.5. The Benefits of the Proposed System, Baht.

Benefit Items		Year 1	Year 2	Year 3	Year 4	Year 5
1. Personnel Reduction						
Officer	1 Person @ 10,000 / Month	10,000	10,500	11,025	11,576	12,155
Staff	3 Person @ 9,500 / Month	28,500	29,925	31,421	32,992	34,642
Monthly Personal Reduction Benefit		38,500	40,425	42,446	44,569	46,797
Total Annual Personal Reduction Benefit		462,000	485,100	509,355	534,823	561,564
2. Operating Time Saving						
Registration Department						
Manager	1 Person @ 11,000 / Month	11,000	12,100	13,310	14,641	16,105
Officer	2 Person @ 8,500 / Month	17,000	18,700	20,570	22,627	24,890
Staff	1 Person @ 7,000 / Month	7,000	7,700	8,470	9,317	10,249
Evaluation Department						
Manager	1 Person @ 11,000 / Month	11,000	12,100	13,310	14,641	16,105
Officer	2 Person @ 8,500 / Month	17,000	18,700	20,570	22,627	24,890
Staff	1 Person @ 7,000 / Month	7,000	7,700	8,470	9,317	10,249
Financial Department						
Officer	2 Person @ 8,500 / Month	17,000	18,700	20,570	22,627	24,890
Monthly Operating Time Saving		87,000	95,700	105,270	115,797	127,377
Total Annual Operating Time Saving		1,044,000	1,148,400	1,263,240	1,389,564	1,528,520
3. Office Supplies & Miscellaneous Cost Reduction						
Stationary	25,000 Baht / Year	25,000	27,500	30,250	33,275	36,603
Office Supplies	26,000 Baht / Year	26,000	28,600	31,460	34,606	38,067
Computer Supplies	30,000 Baht / Year	30,000	33,000	36,300	39,930	43,923
Utilities	16,000 Baht / Year	16,000	17,600	19,360	21,296	23,426
Miscellaneous	17,000 Baht / Year	17,000	18,700	20,570	22,627	24,890
Annual Office Supplies & Miscellaneous Cost Reduction		114,000	125,400	137,940	151,734	166,907
4. Expense Saving						
Mailing	53,000 Baht / Year	53,000	58,300	64,130	70,543	77,597
Paper	75,000 Baht / Year	75,000	82,500	90,750	99,825	109,808
Facsimile	65,000 Baht / Year	65,000	71,500	78,650	86,515	95,167
Toner	75,000 Baht / Year	75,000	82,500	90,750	99,825	109,808
Total Annual Expense Saving		268,000	294,800	324,280	356,708	392,379
Total Benefits from implementing computerized system		1,888,000	2,053,700	2,234,815	2,432,829	2,649,370

91

Table G.6. Payback Period for Candidate 1, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-582,100					
Annual Operating Cost		-1,699,000	-1,868,600	-1,969,930	-2,077,487	-2,191,698
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-582,100	-1,544,391	-1,543,464	-1,479,417	-1,418,924	-1,361,045
Cumulative time-adjusted cost over life time:	-582,100	-2,126,491	-3,669,955	-5,149,372	-6,568,296	-7,929,340
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-582,100	-410,299	-257,406	-58,478	184,221	468,435

Table G.7. Payback Period for Candidate 2, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-658,400					
Annual Operating Cost		-1,731,500	-1,915,650	-2,020,555	-2,132,045	-2,250,582
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-658,400	-1,573,934	-1,582,327	-1,517,437	-1,456,186	-1,397,611
Cumulative time-adjusted cost over life time:	-658,400	-2,232,334	-3,814,660	-5,332,097	-6,788,284	-8,185,895
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-658,400	-516,142	-402,112	-241,203	-35,767	211,881

Table G.8. Payback Period for Candidate 3, Baht.

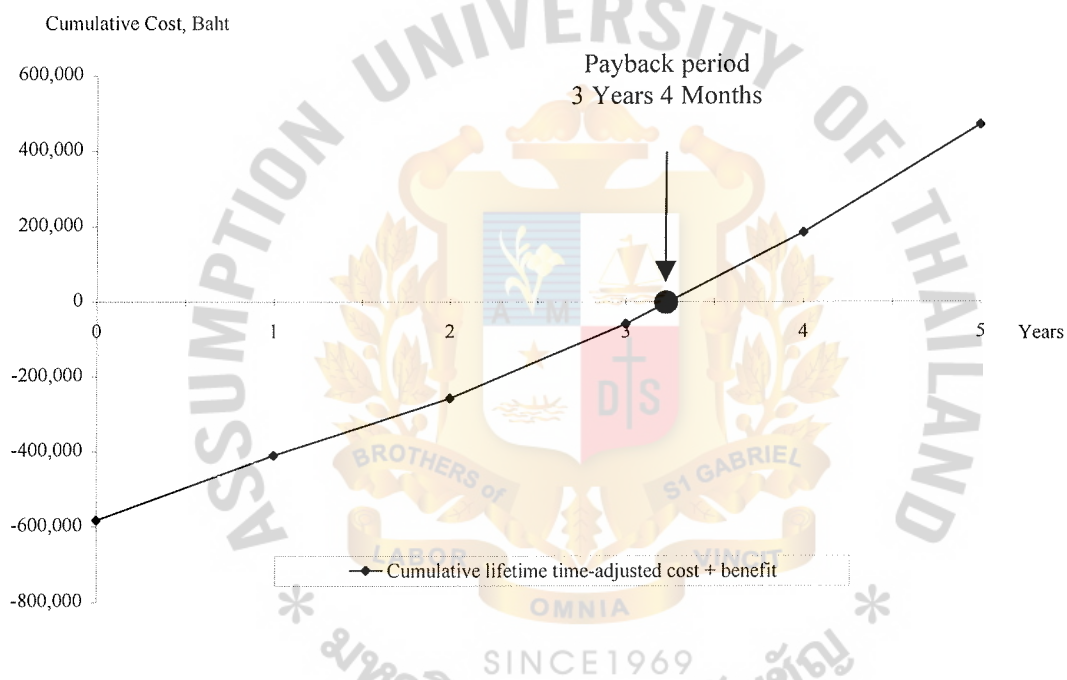| Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-448,600					
Annual Operating Cost		-1,690,000	-1,858,700	-1,959,040	-2,065,508	-2,178,522
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-448,600	-1,536,210	-1,535,286	-1,471,239	-1,410,742	-1,352,862
Cumulative time-adjusted cost over life time:	-448,600	-1,984,810	-3,520,096	-4,991,335	-6,402,077	-7,754,939
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-448,600	-268,618	-107,548	99,559	350,439	642,836

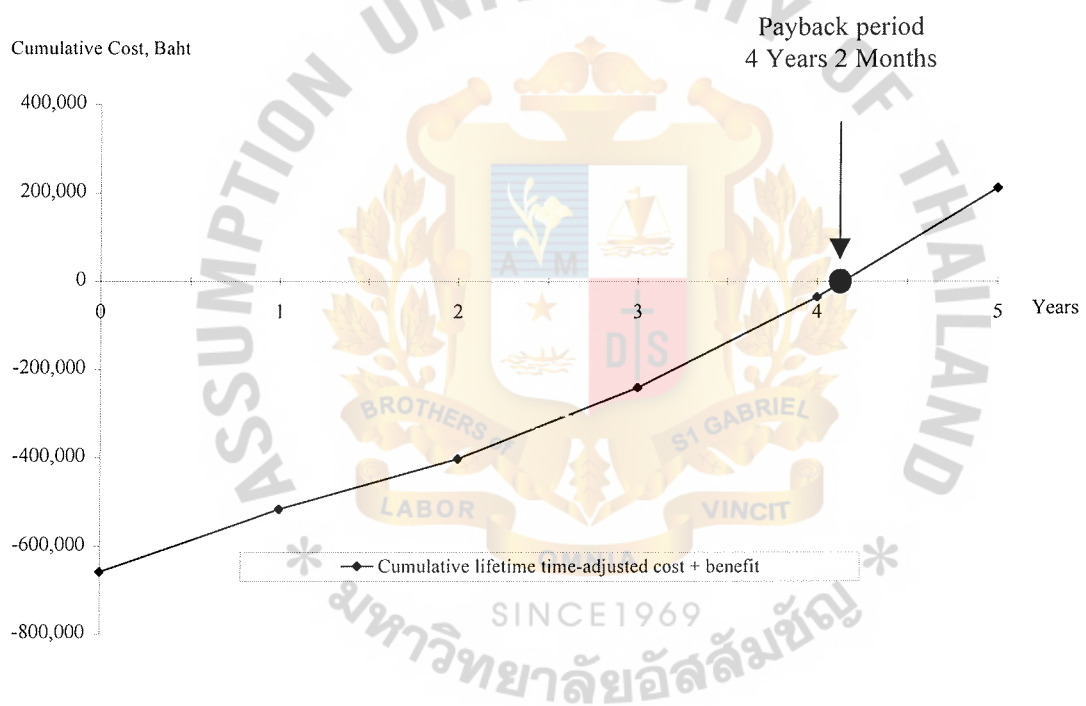Figure G.1.   Payback Period for the Candidate 1.

Figure G.2.   Payback Period for the Candidate 2.
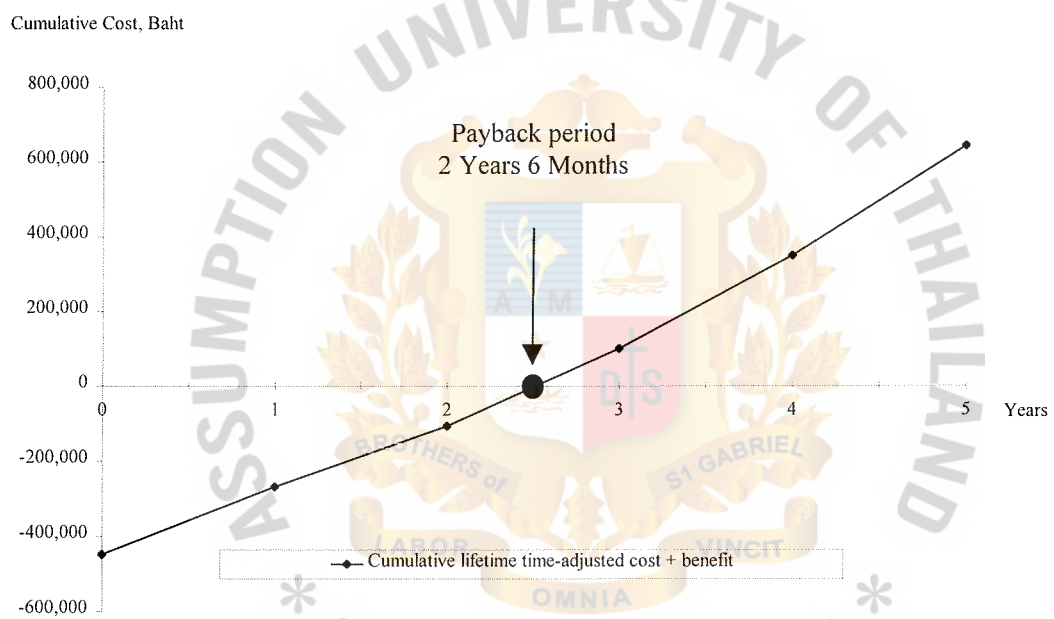
Cumulative Cost, Baht

Figure G.3. Payback Period for the Candidate 3.

Table G.9. Net Present Value for Candidate 1, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-582,100					
Annual Operating Cost		-1,699,000	-1,868,600	-1,969,930	-2,077,487	-2,191,698
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-582,100	-1,544,391	-1,543,464	-1,479,417	-1,418,924	-1,361,045
Cumulative time-adjusted cost over life time:	-582,100	-2,126,491	-3,669,955	-5,149,372	-6,568,296	-7,929,340
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-582,100	-410,299	-257,406	-58,478	184,221	468,435

Table G.10. Net Present Value for Candidate 2, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-658,400					
Annual Operating Cost		-1,731,500	-1,915,650	-2,020,555	-2,132,045	-2,250,582
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-658,400	-1,573,934	-1,582,327	-1,517,437	-1,456,186	-1,397,611
Cumulative time-adjusted cost over life time:	-658,400	-2,232,334	-3,814,660	-5,332,097	-6,788,284	-8,185,895
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-658,400	-516,142	-402,112	-241,203	-35,767	211,881

Table G.11. Net Present Value for Candidate 3, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-448,600					
Annual Operating Cost		-1,690,000	-1,858,700	-1,959,040	-2,065,508	-2,178,522
Discount Factor For 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	-448,600	-1,536,210	-1,535,286	-1,471,239	-1,410,742	-1,352,862
Cumulative time-adjusted cost over life time:	-448,600	-1,984,810	-3,520,096	-4,991,335	-6,402,077	-7,754,939
Benefit derived from operation of the new system:	0	1,888,000	2,053,700	2,234,815	2,432,829	2,649,370
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time Adjust Costs (adjusted to present value)	0	1,716,192	1,696,356	1,678,346	1,661,622	1,645,259
Cumulative time-adjusted benefit over life time:	0	1,716,192	3,412,548	5,090,894	6,752,516	8,397,775
Cumulative lifetime time-adjusted cost + benefit	-448,600	-268,618	-107,548	99,559	350,439	642,836

APPENDIX   H

USER INTERFACE DESIGN

Figure H.1.   Login Form.

Figure H.2.   Main Menu Form.

Figure H.3.   School Detail Form.

Figure H.4.   Student Form.

Figure H.5.   Class List Form.

Figure H.6. Subject Form.

ระบบบันทึกคะแนน

บันทึกคะแนนวัดผลนักเรียน

ปีการศึกษา 2545
ประถมศึกษาปีที่ 1
ห้อง 1
ห้อง 2
ประถมศึกษาปีที่ 2
ประถมศึกษาปีที่ 3
ประถมศึกษาปีที่ 4
ประถมศึกษาปีที่ 5
ประถมศึกษาปีที่ 6

บันทึกคะแนนสอบ | บันทึกจุดประสงค์ | บันทึกเวลาเรียน

เลขที่	รหัส	ชื่อ-นามสกุล	ภาคเรียนที่ 1		ภาคเรียนที่ 2	
			คะแนนเต็ม	คะแนนกลางภาค	คะแนนเต็ม	คะแนนปลายภาค
1	10001	ด.ญ. วันวิสาข์ วรรณกิจ	100	67	100	70
2	10002	ด.ญ. กิติพร ช่วยบุญ	100	85	100	75
3	10003	ด.ญ. สุนิสา สุขเนียม	100	45	100	67
4	10004	ด.ญ. อารีย์ เรืองดำ	100	56	100	80
5	10005	ด.ญ. อัตตาวัลย์ พิทักษ์จำนงศ์	100	45	100	55

เลือกแสดงผล เฉพาะรายการวิชา   TH001 ภาษาไทย

จบการทำงาน

Figure H.7.   Score Form.

103
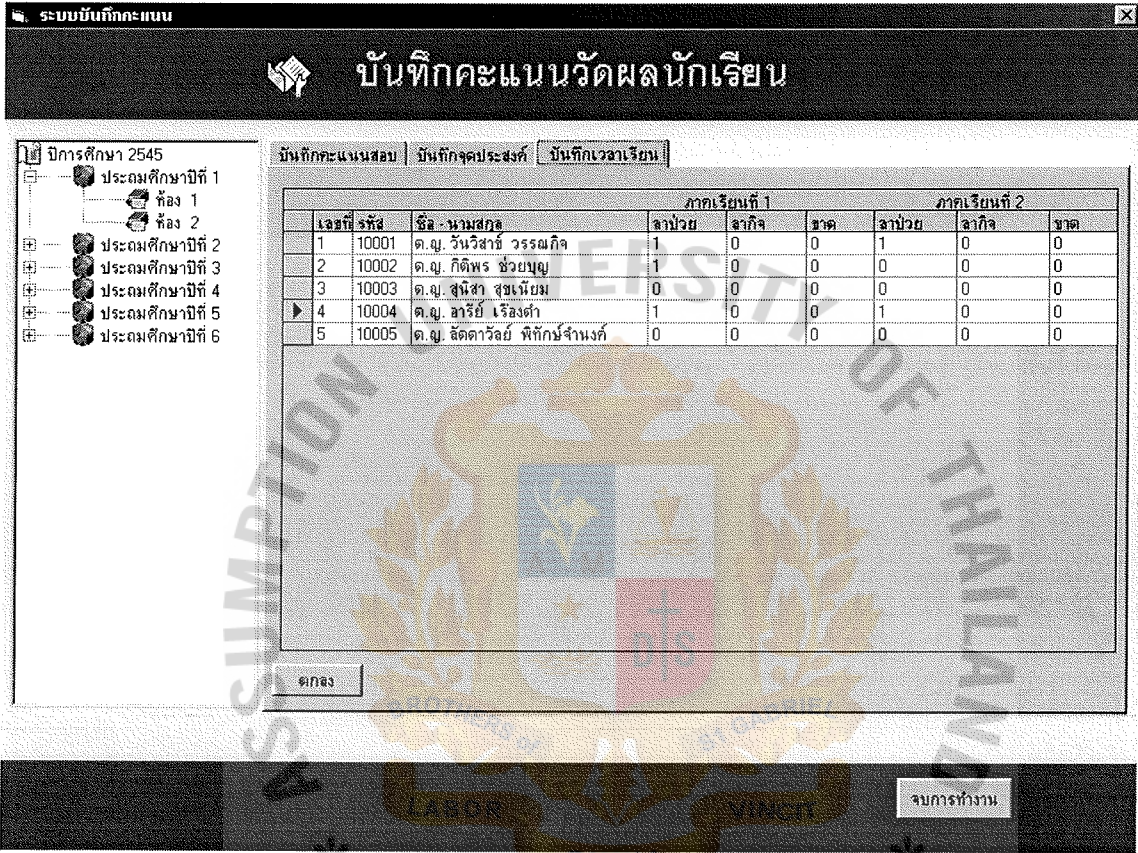
Figure H.8.   Attendant From.
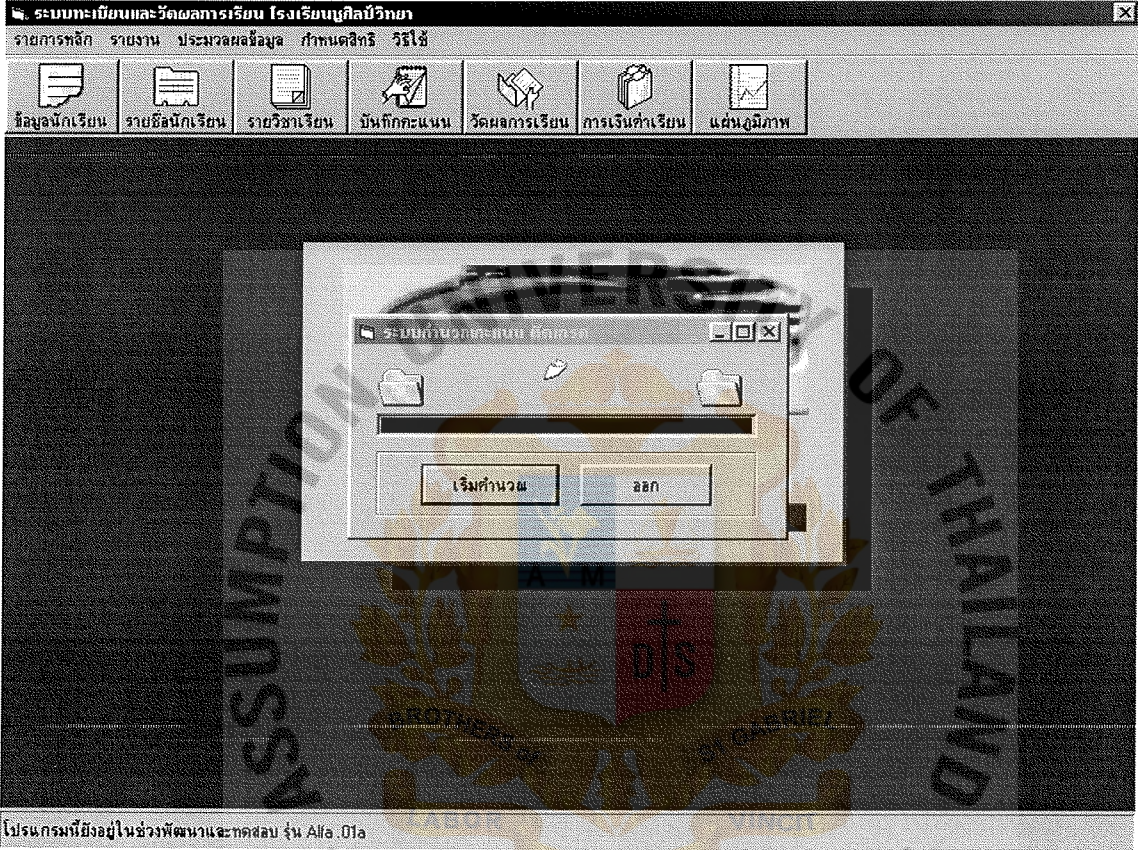
104

Figure H.9.   Grade Calculation Form.

Figure H.10.   Score Evaluation Form.

106

Figure H.11.   Pay-in-slip Form.
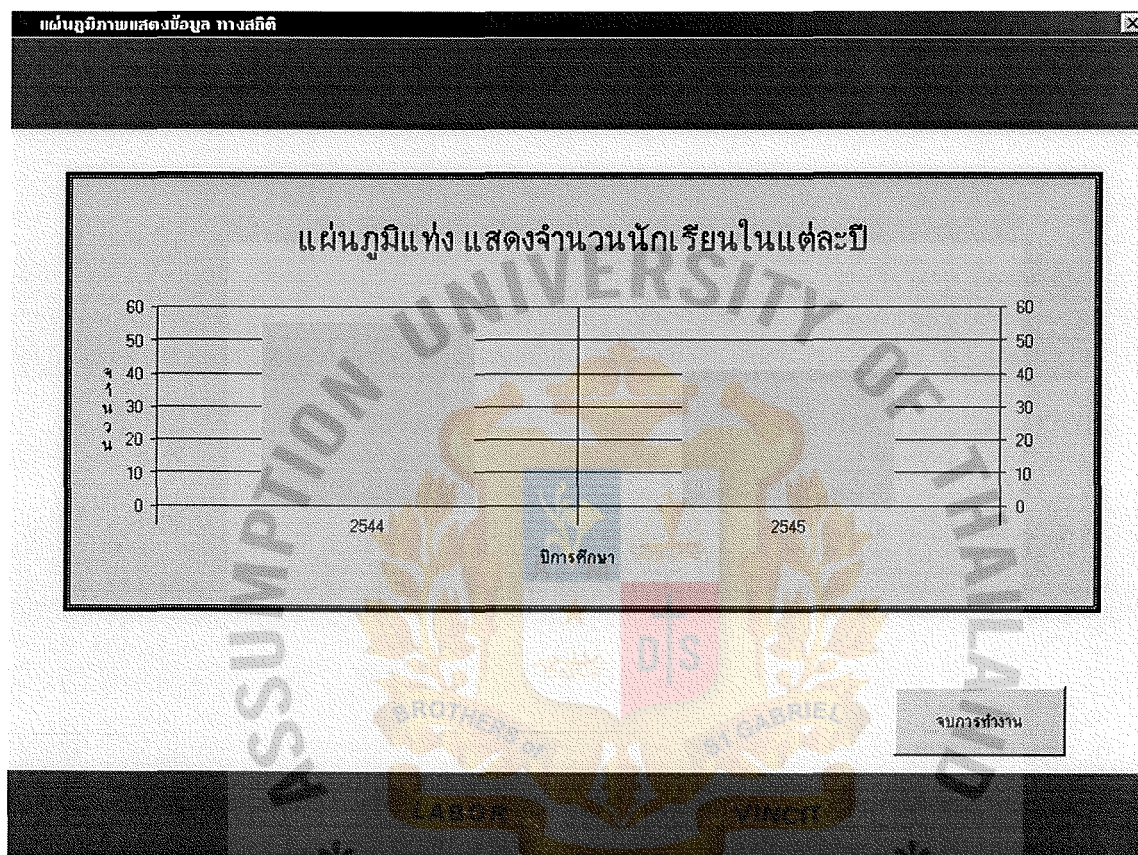
Figure H.12.   Amount of Student Graph.

APPENDIX   I

REPORT DESIGN

Figure I.1.   ID Card.

รายชื่อนักเรียนเข้าศึกษาใหม่   ปีการศึกษา 2545

วันที่ 3 ตุลาคม 2545

หน้า 1

ชั้นประถมศึกษาปีที่ 1 ห้อง 1

ภาคเรียนที่ 1

อาจารย์ประจำชั้น   น.ส. ลัดดาวัลย์ ทองมี

ปีการศึกษา 2545

ลำดับที่	รหัสประจำตัว	ชื่อ-นามสกุล	หมายเหตุ
1	10100	ด.ช. ประวิทย์ มกรากิจ	
2	10101	ด.ช. ถนอม จันทร์เจริญ	
3	10102	ด.ญ. อารีนา เจ๊ะโซ๊ะ	
4	10103	ด.ญ. เมตตา ชัยเจริญ	
5	10104	ด.ช. กรกช เจตจำนง	
6	10105	ด.ช. อานนท์ ไกรคิง	
7	10106	ด.ญ. จิราพร รัตนแก้ว	
8	10107	ด.ญ. พิมชนก อ้วนแก้ว	
9	10108	ด.ญ. โสรญา ฐิติสุนทรณ์	
10	10109	ด.ช. พรากร แสงนิล	
11	10110	ด.ญ. สิริพร นามสุข	
12	10111	ด.ญ. ปรียา อารีนา	
13	10112	ด.ช. กิติพงศ์ ชมนิต	
14	10113	ด.ช. ทิติ สิทะนงศ์	
15	10114	ด.ญ. พรสินี มิตรเมือง	
16	10115	ด.ญ. สุดา ราทสิน	
17	10116	ด.ญ. สีดา ณ นคร	
18	10117	ด.ญ. จันเพ็ญ แสงจันทร์	
19	10118	ด.ญ. ชานิดา พรสิทธิ์	
20	10119	ด.ช. พินิณ เกศทอง	

Figure I.2.   New Student Report.

110

ประวัตินักเรียน โรงเรียนชูศิลป์วิทยา

วันที่ 3 ตุลาคม 2545

หน้า 4

รหัสประจำตัว   10073   ชื่อ-นามสกุล   ด.ญ. ไพริน ดำรงสา

ชั้นประถมศึกษาปีที่   1 ห้อง 2   ปีการศึกษา   2544

อาจารย์ประจำชั้น   น.ส สุเมตร มิตรกูล

ที่อยู่	15/57	ตำบล	ทุ่งหวัง
อำเภอ	เมือง	จังหวัด	สงขลา
รหัสไปรษณีย์	90000	โทร.	075-453201
สัญชาติ	ไทย	ศาสนา	พุทธ
วันเดือนปีเกิด	9 สิงหาคม 2534		
เข้าศึกษาในปี	2544		

Figure I.3.   Historical Student Information Report.

111

รายชื่อนักเรียนที่สำเร็จการศึกษา ประจำปี 2544

วันที่ 3 ตุลาคม 2545

ลำดับที่	รหัสประจำตัว	ชื่อ-นามสกุล
1	10001	ด.ญ. วันวิสาข์ วรรณกิจ
2	10002	ด.ญ. กิติพร ช่วยบุญ
3	10003	ด.ญ. สุนิสา สุขเนียม
4	10004	ด.ญ. อารีย์ เรืองดำ
5	10005	ด.ญ. ลัดดาวัลย์ พิทักษ์จำนงค์
6	10013	ด.ญ. กานดา มารศรี
7	10014	ด.ญ. อามีน๊ะ นิยมเดชา
8	10015	ด.ช. ยูโซ๊ะ แดมิเน๊าะ
9	10016	ด.ญ. อารีนะ แลแม
10	10016	ด.ญ. อารีนะ แลแม
11	10017	ด.ญ. นีราแย๊ะ โป๊ะตาแม
12	10018	ด.ช. องอาจ เนียมสุข
13	10019	ด.ช. นิรุธ เทศทอง
14	10020	ด.ช. นวกร ชูเกียรติ
15	10020	ด.ช. นวกร ชูเกียรติ
16	10021	ด.ช. ราชทาน ธนงค์ศักดิ์
17	10022	ด.ช. ถนอม ถกลศักดิ์
18	10023	ด.ช. สิทธินัย ขุนแก้ว
19	10024	ด.ช. อรรถกร จันทร์แก้ว
20	10025	ด.ช. ภูวนาท รัตนแก้ว
21	10026	ด.ช. สันติ โรจณาสิทธิ์

Figure I.4.   Graduated Student Report by Year.

112

ใบประกาศนียบัตร

ขอมอบให้แก่

ด.ญ. วันวิสาข์ วรรณกิจ

เพื่อแสดงว่า

เป็นผู้สำเร็จการศึกษา ชั้นประถมศึกษาปีที่ 6

จาก **โรงเรียนชูศิลป์วิทยา**

ปีการศึกษา 2544

ให้ไว้ ณ วันที่ 16 มีนาคม พ.ศ. 2545

อาจารย์ใหญ่

Figure I.5   Certificate Report.

รายชื่อนักเรียน ประจำชั้นประถมศึกษาปีที่ 1 ห้อง 2

อาจารย์ประจำชั้น   น.ส สุเมตร มิตรกูล   ปีการศึกษา   2544

ลำดับที่	รหัสประจำตัว	ชื่อ-นามสกุล	หมายเหตุ
1	10070	ด.ญ. เพ็ญศรี แก่นบุญ	
2	10071	ด.ญ. ศิริรัตน์ กิจติ	
3	10072	ด.ช. วรุษ เนืองรุง	
4	10073	ด.ญ. ไพริน ดำรงสา	
5	10074	ด.ช. ประสิทธิ์ อุดมไกล	
6	10075	ด.ญ. ดวงหทัย คงประดิษฐ์	
7	10076	ด.ช. นิเวช วรณารุษ	
8	10077	ด.ช. จิราวัฒฆ เนื่องประสงค์	
9	10078	ด.ช. ปิติพงษ์ นิติรักษ์	
10	10079	ด.ช. รุษ เจริญทรัพยานันต์	
11	10080	ด.ญ. พรพรรณ สุวรรณรัตน์	
12	10081	ด.ญ. วลัยลักษณ์ นิยมเดชา	
13	10082	ด.ช. พิสุทธ์ ธนสิริแก้ว	
14	10083	ด.ญ. จันทร์จิรา วารานุ	
15	10084	ด.ญ. จิตติมา คงเส็ง	
16	10085	ด.ช. กิติสิทธ์ เจริญภัคดี	
17	10086	ด.ช. ศรราม จันทร์มิตร	
18	10087	ด.ญ. ปรีญาภรณ์ มณีรัตน์	
19	10088	ด.ช. มาโนช ศรีสวัสดิ	
20	10089	ด.ช. นิรุธ แก้มเอี่ยม	

Figure I.6.   Student List by Classroom Report.

รายงานแสดงผลเวลาเรียนของนักเรียน

รหัสประจำตัว   10073   **ชื่อ-นามสกุล**   ด.ญ. ไพริน ดำรงสา

ชั้นประถมศึกษาปีที่   1 ห้อง 2   **ปีการศึกษา**   2544

อาจารย์ประจำชั้น   น.ส สุเมตร มิตรกูล

รายการ	จำนวนวัน				
ภาคเรียน	จำนวนวัน	มาเรียน	ลาป่วย	ลากิจ	ขาดเรียน
ภาคเรียนที่ 1	125	125	0	0	0
ภาคเรียนที่ 2	101	100	1	0	0
รวม	**226**	**225**	**1**	**0**	**0**

ผลการตัดสินเกณฑ์การผ่านเวลาเรียน   ผ่าน

Figure I.7.   Assessment Student Attendance Report.

ใบเสร็จรับเงิน

เลขที่ใบเสร็จ 0012203

วันที่ 3 ตุลาคม 2545

ได้รับเงินจาก___ด.ช กิตติพงศ์ เรียบร้อย_____

ระดับชั้น ประถมศึกษาปีที่ 5   **ภาคเรียนที่** 1   **ปีการศึกษา** 2545

รายการที่	รายการการเงิน	จำนวนเงิน
1	ค่าเล่าเรียน	750.00
2	ค่าวัสดุการเรียน	500.00
3	ค่าอาหารกลางวัน	750.00
4	บำรุงการศึกษา	200.00
5	ค่ารถ-รับส่ง	300.00
	รวมเป็นเงิน	2500.00

_____

เจ้าหน้าที่รับเงิน

Figure 1.8.   Pay-in-Slip.

116

รายงานผลเกรดของนักเรียน ประจำภาคเรียน

ชั้นประถมศึกษาปีที่ 1 ห้อง 2

ภาคเรียนที่ 1

อาจารย์ประจำชั้น   น.ส สุเมตร มิตรกูล

ปีการศึกษา 2544

ลำดับที่	รหัสประจำตัว	ชื่อ-นามสกุล	TH001	MA001	EN001	SL001	SN001
1	10070	ด.ญ. เพ็ญศรี แก่นบุญ	3	3	2	3	3
2	10071	ด.ญ. ศิริรัตน์ กิจติ	3	3	2	4	3
3	10072	ด.ช. วรุษ เนืองรุง	4	3	2	2	4
4	10073	ด.ญ. ไพริน ดำรงสา	4	3	3	2	3
5	10074	ด.ช. ประสิทธิ์ อุดมไกล	4	3	2	4	3
6	10075	ด.ญ. ดวงหทัย คงประดิษฐ์	4	3	3	3	3
7	10076	ด.ช. นิเวช วรณารุษ	3	2	3	3	3
8	10077	ด.ช. จิราวัฒน เนื่องประสงค์	4	3	3	3	3
9	10078	ด.ช. ปิติพงษ์ นิติรักษ์	3	2	4	4	3
10	10079	ด.ช. รุษ เจริญทรัพยานันต์	4	3	4	4	4
11	10080	ด.ญ. พรพรรณ สุวรรณรัตน์	2	4	4	4	4
12	10081	ด.ญ. วลัยลักษณ์ นิยมเดชา	4	2	2	4	3
13	10082	ด.ช. พิสุทธิ์ ธนสิริแก้ว	4	3	2	3	3
14	10083	ด.ญ. จันทร์จิรา วารานุ	3	2	2	3	3
15	10084	ด.ญ. จิตติมา คงเส็ง	3	3	3	3	3
16	10085	ด.ช. กิติสิทธิ์ เจริญภัคดี	2	3	3	3	3
17	10086	ด.ช. ศรราม จันทร์มิตร	3	3	2	3	2
18	10087	ด.ญ. ปริญาภรณ์ มณีรัตน์	3	4	2	3	2
19	10088	ด.ช. มาโนช ศรีสวัสดิ	3	4	3	3	4
20	10089	ด.ช. นิรุธ แก้มเอี่ยม	3	3	4	3	4

Figure I.9.   Grade by Classroom Report.

117

รายงานแสดงผลคะแนนสอบและเกรดของนักเรียน

วันที่   3 ตุลาคม 2545

รหัสประจำตัว   10073

ชื่อ-นามสกุล   ด.ญ. ไพริน   ดำรงสา

ชั้นประถมศึกษาปีที่   1 ห้อง 2

ปีการศึกษา   2544

อาจารย์ประจำชั้น   น.ส สุเมตร มิตรกูล

วิชาเรียน	ภาคเรียนที่ 1			ภาคเรียนที่ 2		
	คะแนนเต็ม	สอบได้	เกรด	คะแนนเต็ม	สอบได้	เกรด
ภาษาไทย	100	84	4	100	80	4
คณิตศาสตร์	100	78	3	100	81	4
ภาษาอังกฤษ	100	75	3	100	71	3
สร้างเสริมประสบการณ์ชีวิ	100	68	2	100	70	3
สร้างเสริมลักษณะนิสัย	100	77	3	100	83	4

ผลการตัดสินเกณฑ์การสอบปลายปี   **ผ่าน**

Figure I.10.   Transcript.

118

กราฟรายงานสรุปจำนวนนักเรียนในแต่ละปีการศึกษา

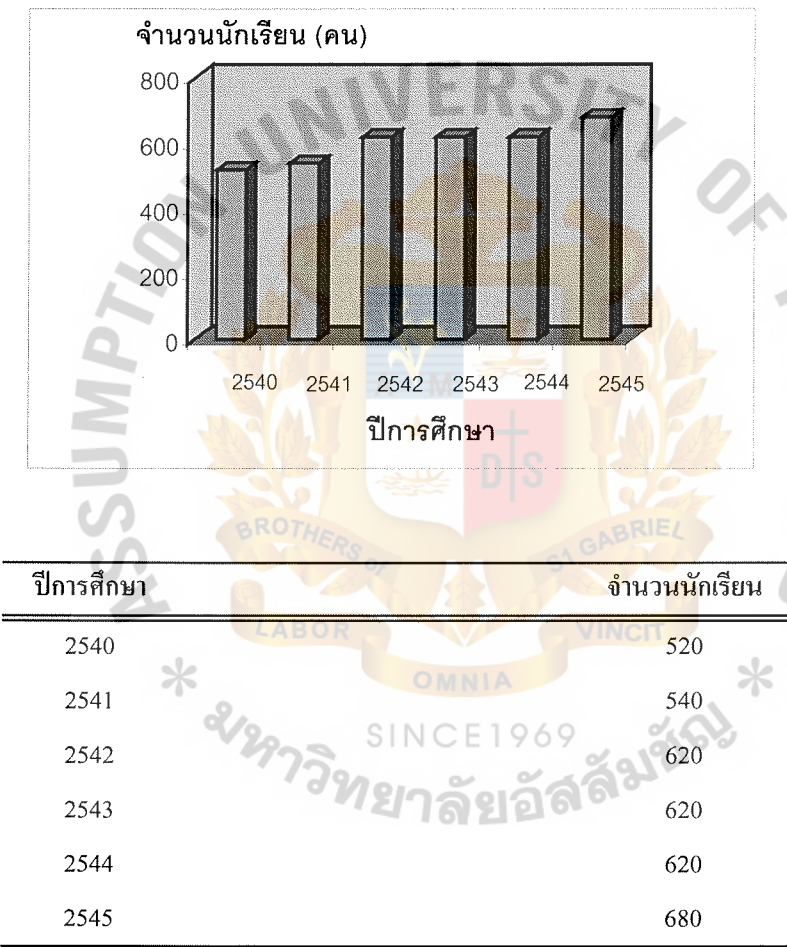| ปีการศึกษา	จำนวนนักเรียน
2540	520
2541	540
2542	620
2543	620
2544	620
2545	680

Figure I.11.   Summary Student Statistic Report by Year.

รายงานผลการเรียนเฉลี่ยในแต่ละรายวิชา ในปีการศึกษา 2544 ระดับชั้น ป.6

ลำดับที่	รหัสประจำตัว	รายชื่อ - นามสกุล	ภาษาไทย	คณิตศาสตร์	สปช.	สลน.
1	10000	ด.ญ. อรวรรณ รามสิน	78	56	85	65
2	10001	ด.ญ. วันวิสาข์ วรรณกิจ	65	75	55	77
3	10002	ด.ญ. กิติพร ช่วยบุญ	54	68	84	63
4	10003	ด.ญ. สุนิสา สุขเนียม	86	75	68	80
5	10004	ด.ญ. อารีย์ เรืองดำ	47	55	68	65
6	10005	ด.ญ. ลัดดาวัลย์ พิทักษ์จำนงค์	54	58	60	65
7	10006	ด.ญ. อุทัยวรรณ มากชูชิต	86	78	68	71
8	10007	ด.ญ. นริสา ดิงมะนอ	62	65	80	75
9	10008	ด.ญ. รัชนี ทันนาเขต	45	87	68	66
10	10009	ด.ญ. ปิยะรัตน์ นิรัตกุล	86	65	72	68
11	10010	ด.ญ. นาตยา พรหมเรือง	62	75	82	72
12	10011	ด.ญ. เพ็ญศรี กรุงไกล	68	66	56	82
13	10012	ด.ญ. ดวงฤดี ห้วยแก้ว	72	68	65	56
14	10013	ด.ญ. กานดา มารศรี	82	72	82	65
15	10014	ด.ญ. อามีน๊ะ นิยมเดชา	56	82	75	82
16	10015	ด.ช. ยูโซ๊ะ แดมิเน๊าะ	65	56	65	85
17	10016	ด.ช. อารีนะ แลแม	82	65	45	65
18	10017	ด.ช. นีราแย๊ะ โป๊ะตาแม	70	82	77	87
19	10018	ด.ช. องอาจ เนียมสุข	61	65	45	78
20	10019	ด.ช. นิรุธ เทศทอง	77	65	75	78
		ค่าเฉลี่ยรายวิชา	67.9	68.9	68.75	72.25

Figure I.12.   Summary Evaluation Report by Classroom.

120

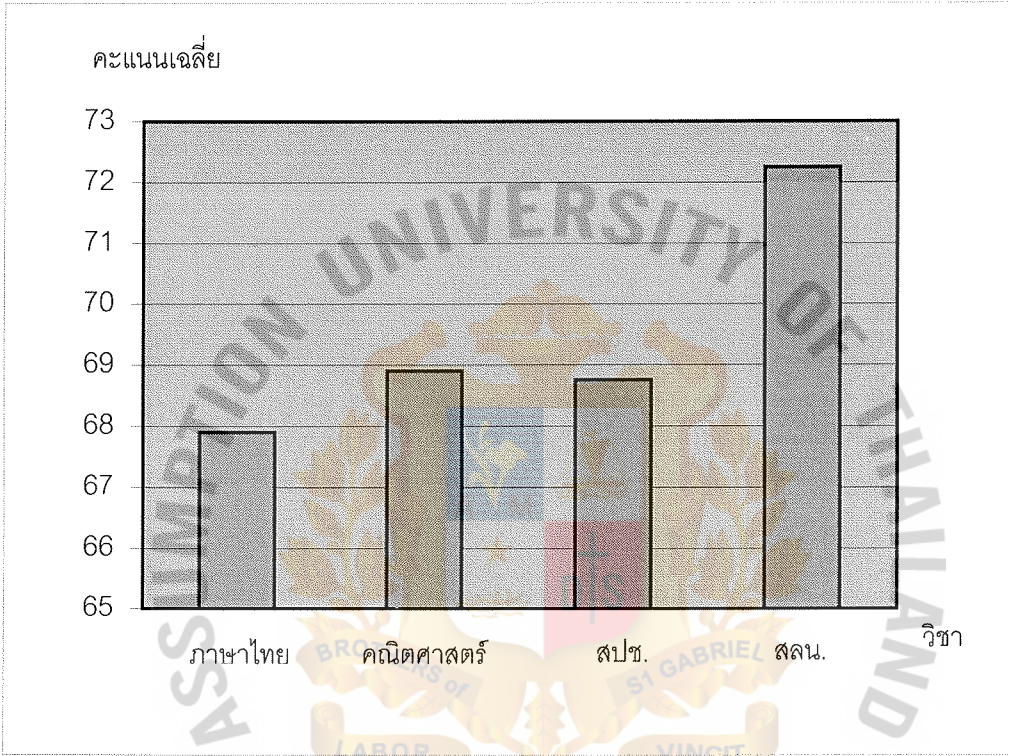**กราฟแสดงผลการเรียนเฉลี่ยในแต่ล่ะรายวิชา ในปีการศึกษา 2544 ระดับชั้น ป.6**
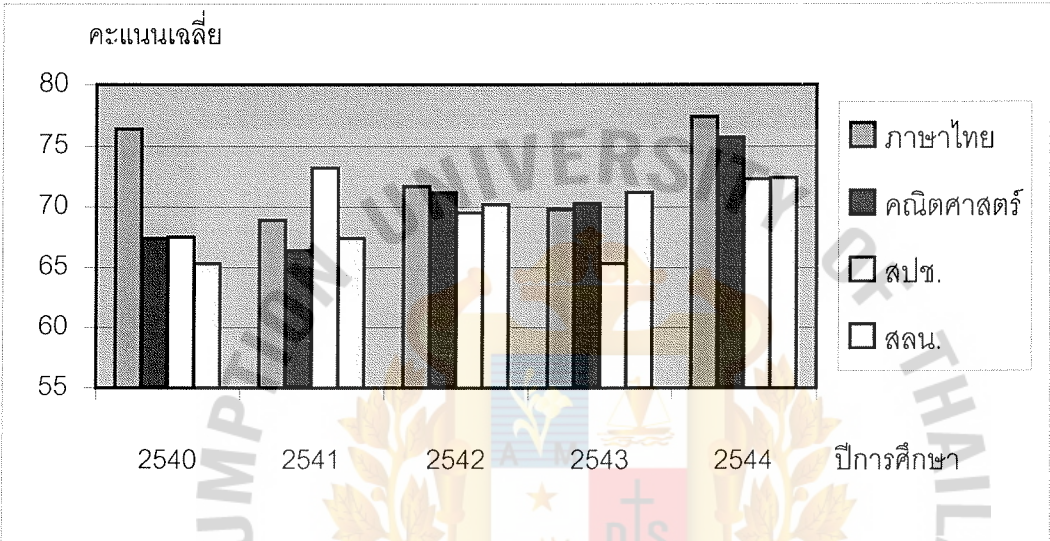

Figure I.12.   Summary Evaluation Report by Classroom (Continued).

รายงานผลการเรียนเฉลี่ยในแต่ละรายวิชาเทียบระหว่างช่วงปีการศึกษา

ปีการศึกษา	ภาษาไทย	คณิตศาสตร์	สปช.	สลน.
2540	76.4	67.4	67.5	65.3
2541	68.9	66.4	73.2	67.4
2542	71.7	71.2	69.5	70.2
2543	69.8	70.3	65.3	71.2
2544	77.4	75.7	72.3	72.4

Figure I.13.   Summary Evaluation Report by Year.

122

BIBLIOGRAPHY

1. Boynton, William C. and Walter G. Kell. Modern Auditing, Sixth Edition. NJ: John Wiley & Sons, 1996.

2. Bronzite, Michael. Introduction to Oracle. London: McGraw-Hill, 1989.

3. Chittayasothorn, Suphamit. Seminar Relational Database Design. Bangkok Palace, Bangkok: Institute of Thai Information Technology, 1994.

4. Date, C. J. An Introduction to Database Systems, Seventh Edition. MA: Addison-Wesley, 2000.

5. Forouzan, Behrouz A. Data Communications and Networking, Second Edition. Boston: McGraw-Hill International, 2001.

6. Goldman, James E., Phillip T. Rawles, and Julie R. Mariga. Client/Server Information Systems. NY: John Wiley & Sons, Inc., 1999.

7. Hughes, Jeffrey F. and Blair W. Thomas. Novell's Guide to NetWare 4.1 Networks. CA: Novell Pr., 1996.

8. Kendell, Kenneth E. and Julie E. Kendell. System Analysis and Design, Third Edition. NJ: Prentice-Hall, 1995.

9. Kendell, Penny A. Introduction to Systems Analysis and Design: A Structure Approach, Second Edition. IA: Wm. C. Brown, 1992.

10. Korth, F. Henry and Abraham Slberschatz. Database System Concepts. NY: McGraw-Hill International, 1991.

11. Laudon, Kenneth C. and Jane P. Laudon. Management Information Systems, Sixth Edition. NJ: Prentice-Hall International Company, 2000.

12. McMonnies, Alistair. Visual Basic: An Object Oriented Approach. Harlow: Addison-Wesley, 2001.

13. Nath, Aloke. The Guide to SQL Server. Reading, MA: Addison-Wesley, 1990.

14. Stallings, William. Local and Metropolitan Area Networks, Sixth Edition. NJ: Prentice Hall International, 2000.

15. Whitten, Jeffrey L., Lonnie D. Bentley, and Kevin C. Dittman. Systems Analysis and Design Methods, Fifth Edition. Boston: McGraw-Hill, 2001.